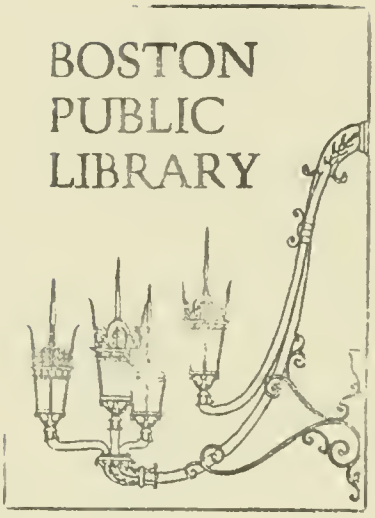
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TRANSPORTATION IMPACT STUDY & ACCESS PLAN

Temple Israel Site Parking Garage and Mixed use Development Boston, Massachusetts

Vanasse Hangen Brustlin, Inc.

March, 1987

TRANSPORTATION IMPACT STUDY AND ACCESS PLAN

TEMPLE ISRAEL PARKING GARAGE AND MIXED-USE DEVELOPMENT

prepared for

MEDICAL AREA SERVICE CORPORATION (MASCO)

March, 1987

prepared by

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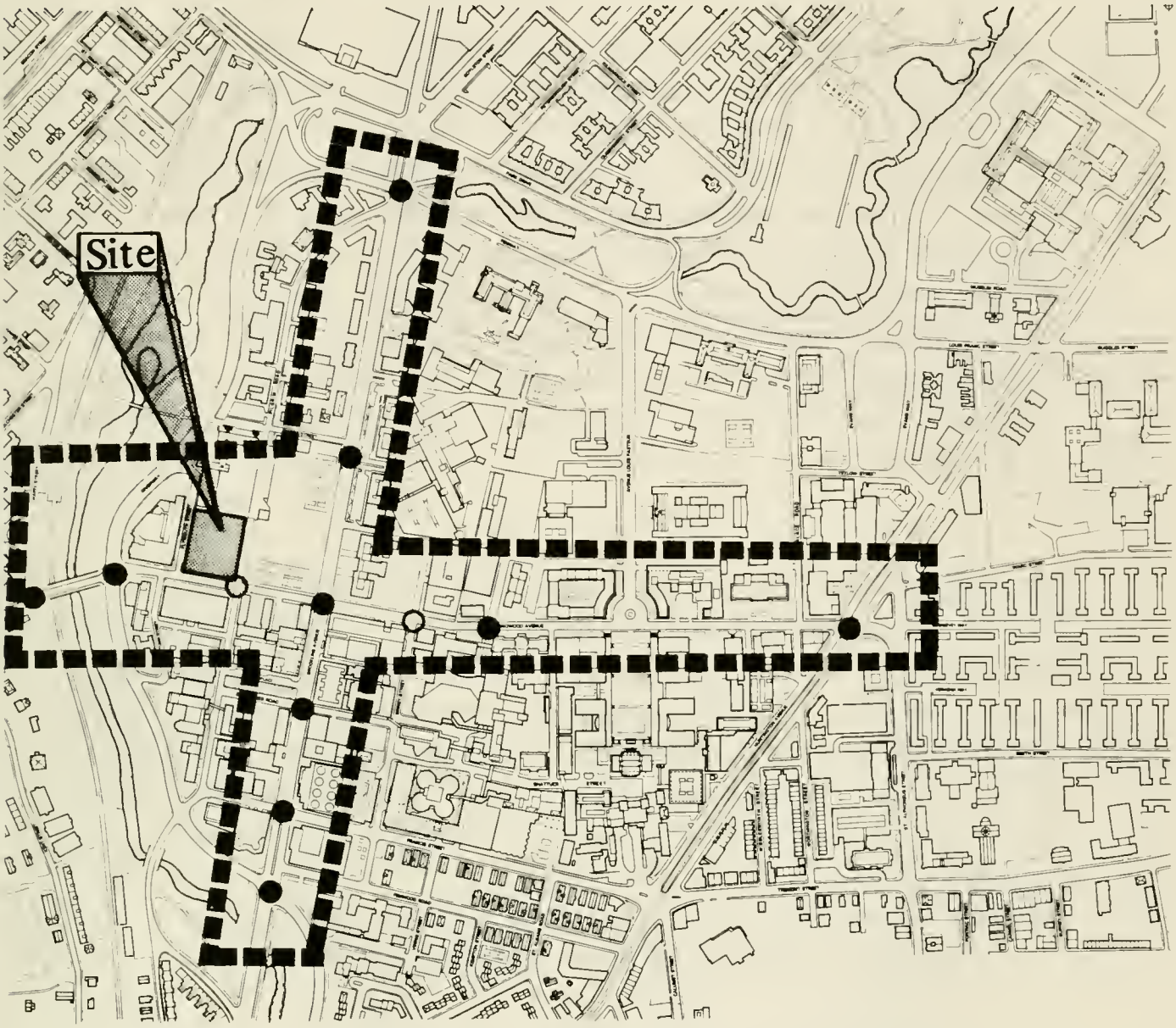
INTRODUCTION

The Medical Area Service Corporation (MASCO) is proposing to construct a 750-space parking garage with mixed-use space development on the site adjacent to the Temple Israel on Longwood Avenue at Plymouth Street in the Longwood Medical Area (LMA) of the Mission Hill and Fenway sections of Boston. Currently, this site is used as a surface parking lot, providing 225 spaces for daily parking. MASCO's concept for the project is a mixed-use development consisting of a 750-space parking garage, general and research-oriented medical office space, commercial/retail space targeted for the LMA market, and a MASCO-affiliated child care facility. It is estimated that the facility will be available for occupancy in late 1989. Figure 1 illustrates the site location in relation to the LMA study area.

This report provides an assessment of existing traffic conditions on roadways adjacent to the site and includes an assessment of project related traffic, parking and circulation impacts within the defined study area. Also included is a detailed set of transportation mitigation measures, which are contained in the Access Plan section of this report.



Site Location Map

LEGEND:

- ■■ Transportation Study Area
- ● Signalized Analysis Location
- ○ Unsignalized Analysis Location

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Scale: 1"=600'±

Fig. 1

STUDY APPROACH

A large amount of information exists in recent transportation studies of the LMA. This study attempts to utilize all pertinent information in order to fully evaluate the characteristics and travel patterns of both clients and workers of this unique urban area. Due to a perceived increasingly congested traffic situation, particularly during the early morning and late afternoon periods, the study area was broadly defined as outlined in Figure 1. Primary focus was on 10 signalized and one unsignalized intersection along Brookline Avenue and Longwood Avenue within this defined study area. To a large extent, vehicular traffic movement is both controlled and constrained by the operation of these intersections.

Although good public transportation is available within the study area, the focus of the study was on the vehicular traffic implications of a development whose primary usage is as a parking garage. The approach taken attempts to directly address the most critically congested peak hours of traffic as related to this proposed facility and its location within the LMA. In order to fully evaluate these, the following questions were addressed:

- What are the estimated traffic characteristics and impacts of the proposed site development proposal?

- What traffic mitigation and access strategies are appropriate in order to accommodate the proposed use for this site?

DEVELOPMENT PROPOSAL

The proposed development program provides a unique mixture of uses for this area. The total development program is 77,500 square feet (excluding parking) and 317,500 square feet if parking is included. The intended uses include a 750-space parking garage serving both building and LMA users, including prepaid monthly parkers, patients and visitors; office space for MASCO and general market use; research oriented medical offices; commercial/retail space for either MASCO's retail services or the general retail market in the LMA; and new facilities for the LMA Child Care Center, designed to support up to 150 children. Table 1 summarizes the development proposal analyzed in this study.

TABLE 1
PROPOSED DEVELOPMENT PROGRAM ANALYZED

Use	Gross Square Footage
General Offices	25,000
Medical Related Offices	25,000
Commercial/Retail	20,000
Child Care Facility	7,500
(Total Excluding Parking)	77,500
Parking - 750 spaces	240,000
(Total Including Parking)	317,500

A copy of the site plan is provided in the Appendix. An important feature from a transportation circulation impact is the proposed drop off loop. This would serve the Temple Israel and child care center primarily.

Since the site currently is used for a surface parking lot of 225 spaces for LMA monthly parkers, the net increase of parking spaces includes 525 new spaces. These new spaces will be allocated to occupants of the new building, existing members of the LMA, and to general public use.

EXISTING CONDITIONS

A comprehensive field inventory and surveillance was conducted during the months of November and December of 1986 to update previously collected roadway data, traffic volumes and operating characteristics. The major roadways evaluated in the existing street system and their observed operating characteristics are described below.

MAJOR ROADWAY CHARACTERISTICS

o Longwood Avenue

Longwood Avenue is a major two-way arterial in the LMA extending in a northeast-southwest direction (for discussion purposes, Longwood Avenue is referred to as an east-west street). At the site, between perpendicular Pilgrim Road and Plymouth Street, the roadway includes two travel lanes, one in each direction, and with a single parking lane along the south side of the roadway. Just west of the site, Longwood Avenue expands to provide two travel lanes on its westbound approach to the Riverway, providing a left turn only lane and a through/right lane at this intersection. East of the site and Pilgrim Road, Longwood Avenue is 33 feet wide with a travel lane in each direction and a single metered parking lane on the south side of the roadway.

Land use in the immediate area includes the Temple Israel adjacent to the site, Winsor School buildings and playing fields to the north and east of the site, New England Deaconess Garage and Hospital across Longwood Avenue, and the Joslin Diabetes Center complex across Longwood Avenue to the east of Pilgrim Road.

East of Brookline Avenue, Longwood Avenue generally provides consistent one-lane of travel in each direction, with one lane of parking on the south side, except for the section between Brookline Avenue and Binney Street, where the roadway is 42 feet wide and features four travel lanes, two per direction, and no parking. Land use in this area is primarily institutional and includes Children's Hospital, Harvard Medical School, 333 Longwood Avenue building, the Longwood Medical Building (319 Longwood Avenue), and the Massachusetts College of Art.

West of the Riverway, Longwood Avenue enters the Town of Brookline. This section provides 34 feet of roadway, which generally operates as two lanes on the westbound direction approach to Chapel Street, and with one travel lane provided for the eastbound direction on Longwood Avenue approaching the Riverway. The land use in this area marks a departure from the LMA and is primarily residential.

o Brookline Avenue

As the primary arterial serving the LMA, Brookline Avenue runs in a northeast-southwest direction connecting Kenmore Square with Route 9 on either side of the LMA. (For discussion purposes, Brookline Avenue will be referred to as a north-south street.) North of Longwood Avenue between the Riverway to Longwood Avenue, Brookline Avenue generally provides 58 to 62 feet of roadway, with two travel lanes in each direction, intermittent metered parking and bus stops on each side of the roadway. Land use in this area is primarily institutional and includes the Dana-Farber Cancer Institute, the New England Deaconess Hospital and the Joslin Diabetes Center.

Proceeding north from Longwood Avenue to the Fenway, Brookline Avenue is also generally a 58 to 62-foot wide roadway

with metered parking provided on each side of the street and two travel lanes in each direction. Land use is also primarily institutional and includes Beth Israel Hospital, Winsor School, Simmons College, and Emmanuel College.

TRAFFIC VOLUMES

Mechanical traffic volume counts were collected in October 1986 at several locations in the study area. Daily and peak hour traffic volume information is summarized in Table 2.

TABLE 2
EXISTING TRAFFIC VOLUME SUMMARY

Location	AWDT*	AM Peak Hour (vph)**	Percent of AWDT	PM Peak Hour (vph)	Percent of AWDT
OCTOBER-NOVEMBER, 1986 DATA					
Longwood Avenue between Binney and Blackfan Streets					
Eastbound	8,925	597	6.7%	455	5.1%
Westbound	5,675	321	5.7%	523	9.2%
Total	14,600	918	6.3%	978	6.7%
Brookline Avenue south of Longwood Avenue					
Northbound	15,510	925	5.9%	817	5.3%
Southbound	12,770	634	4.9%	920	7.2%
Total	28,280	1,559	5.5%	1,737	6.1%

* AWDT = Average weekday daily traffic measured in vehicles per day.
** vph = vehicles per hour.

The results of this count information indicate that Longwood Avenue carries 14,600 vehicles per day, with 8,925 vehicles in the westbound direction and 5,675 vehicles in the eastbound

direction. Brookline Avenue carries 28,280 vehicles per day, with 12,770 in the southbound direction and 15,510 in the northbound direction.

In order to supplement previously collected data, turning movement counts were conducted at four locations during the morning and evening peak periods. These new counts were taken at Brookline Avenue/Beth Israel Hospital Driveway and Longwood Avenue at Chapel Street, Pilgrim Road and Plymouth Street/Autumn Street. The results of these data are presented for the AM and PM peak hours in Figures 2 and 3, respectively.

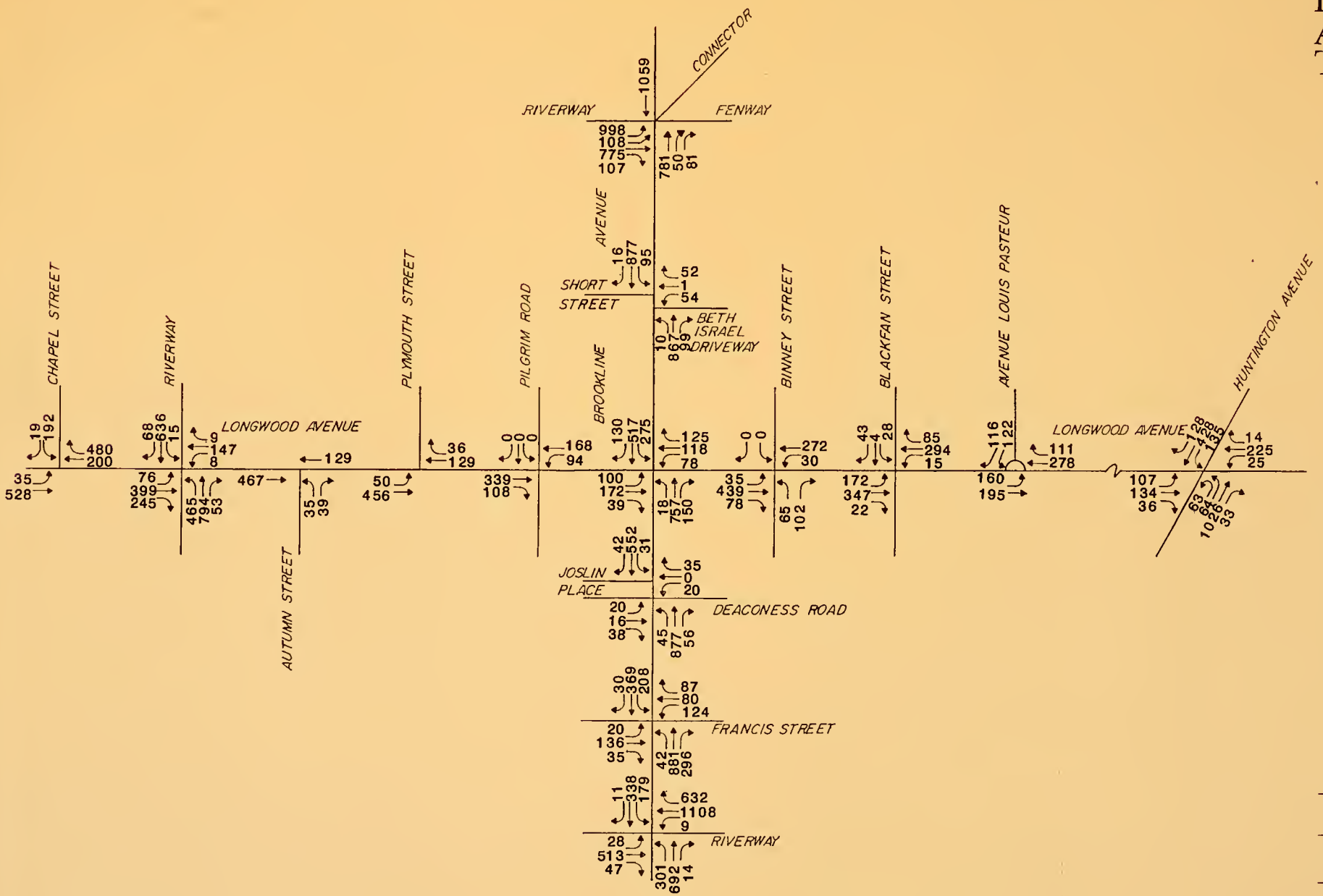
The highest hourly volume occurring on Longwood Avenue generally occurs between 5:00 and 6:00 PM, and represents approximately 6.7 percent of the total daily traffic. For Brookline Avenue, the peak hour generally occurs between the hours of 4:45 and 5:45, and represents approximately 6.1 percent of the total daily traffic.

PARKING

Parking for the LMA is provided by both MASCO and area institutions. Overall, there currently exist 1,964 short-term public spaces, 3,582 long-term employee spaces and approximately 1,100 metered spaces. In addition, there are approximately 1,800 off-site parking spaces to and from which MASCO provides some shuttle bus service. These off-site spaces include 700 spaces in the Kenmore area, 350 spaces in the Allston section of Boston, 300 spaces at the Wentworth Institute of Technology and 450 spaces at various Institution-managed locations.[1]

1/ Source: Medical Area Service Corporation

Existing A.M. Peak Hour Traffic Volumes



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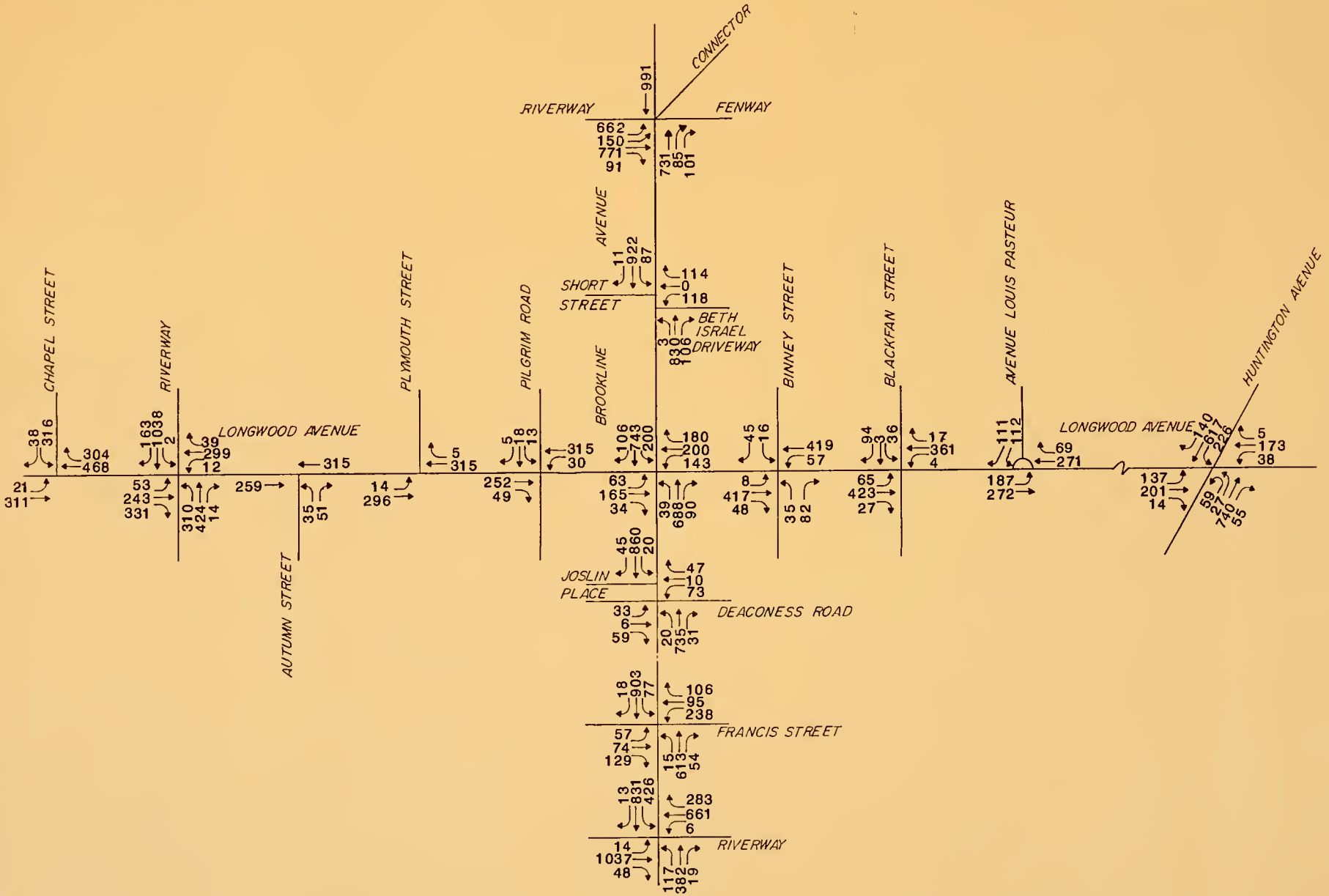
Not to Scale

Fig. 2

Existing P.M. Peak Hour Traffic Volumes



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Not to Scale

Fig. 3

MASCO directly manages approximately 3,118 spaces of these total spaces. Table 3 describes the distribution of these MASCO-managed spaces.

TABLE 3
MASCO-MANAGED PARKING FOR LMA

Category	Number of Spaces
MASCO	
On-Site Short-Term Public Spaces	712
On-Site Employee Spaces	1,056
Off-Site Employee Spaces	1,350
Total MASCO-Managed Spaces	3,118

Source: Medical Area Service Corporation, Children's Hospital

PUBLIC TRANSPORTATION

Public transportation in the LMA is extensive with MBTA bus service to/from Cambridge, Roxbury, Chestnut Hill, Brighton and Kenmore Square. MBTA Green line service is provided on Arborway line (Route "E") and the Riverside Line at Longwood Avenue/ Chapel Street. In addition, MASCO provides shuttle bus services to/from the off-site parking areas, Cambridge, Coolidge Corner and Kenmore Square. According to MASCO and the MBTA, at the point at which these transit routes pass the LMA, adequate capacity is available for LMA passengers.

PROBABLE PROJECT IMPACTS

INTRODUCTION

In order to identify the additional vehicle-trips and transportation impacts associated with the proposed site development, it was necessary to separate the intended uses into component parts in order to fully estimate traffic generation. The most dominant use will be the net increase of 525 new parking spaces (the proposed garage will provide 750 spaces and there currently exists 225 spaces on the site). The arrival and departure patterns of users of the garage and how these spaces are allocated to meet the parking demand is therefore key to the analysis. Additionally, it was important to estimate the vehicle trip-making characteristics associated with the other occupant uses proposed for the site and the net increase in trips. The following paragraphs describe each of these components and the methodology associated with estimation of vehicle-trips on a daily and peak hour basis.

The proposed garage will have three distinct sets of users based on the allocation of space to MASCO members, building occupants and public parking use. Trip generation estimates are based on characteristics of each group and the allocation of 750 spaces for all uses.

TRIP GENERATION

MASCO Members Component

The existing site use as a surface parking lot provides 225 spaces for MASCO member users to pay on a monthly basis for long-term or daily parking space. Generally, these users arrive in the morning, stay the length of the day, and leave in the late

afternoon or evening. Therefore, the existing use includes approximately 236 daily trips into the site and 236 daily trips out of the site including estimated midday trips. Based on traffic counts on Pilgrim Road and Plymouth Street, which provide site access, both the morning peak and evening peak volumes were calculated, indicating the patterns of use for the existing site by the amount of traffic attributable to the peak hours.

The proposed development program intends to increase this amount of space for monthly users from 225 to 520 spaces. From discussions with MASCO, it was determined that the employee mix of LMA workers to be allocated new spaces would essentially be the same as current users. Thus, the net increase of 295 monthly users would have trip generation or parking space use characteristics similar to the current site users. Table 4 summarizes both existing and estimated project trip generation related to the monthly user component.

TABLE 4
TRIP GENERATION ESTIMATES FOR MEMBER USERS COMPONENT

	No. of Spaces	AM Peak In	AM Peak Out	PM Peak In	PM Peak Out	Daily In	Daily Out	Total*
Existing Surface Lot	225	86	0	19	86	236	236	472
Proposed Parking Garage	520	192	0	42	192	546	546	1,092
Net Increase	+295	+106	0	+23	+106	+310	+310	+620

* Includes in/out trips and mid-day trips estimated.

Based on these estimates, daily vehicle-trips to the proposed garage for the monthly users component would increase by 620 new daily vehicle-trips (total entering and exiting). For the morning peak, 106 additional vehicle-trips entering occur while for the afternoon peak, 23 additional entering and 106 additional exiting trips are projected.

Building Occupants Component

Trip generation associated with the building occupant uses of the proposed development include both employee and non-employee trips. Estimates are based on square footage and other characteristics pertaining to the activity and its location within the LMA. The following discussions detail the number of daily vehicle-trips attributable to each use.

General Office Space

The proposed site development would include 25,000 square feet of general office space use. Based on a study of employees for similar office space in the Back Bay section of Boston, trip generation rates, transit share, and vehicle occupancy factors were applied to obtain estimates of daily and peak hour vehicle-trips to the proposed site. These assumptions include auto mode split of 37 percent for work trips, and 45 percent for non-work trips, with 55 percent of the work trips occurring during the morning and afternoon peak periods. Vehicle occupancy factors assume a 1.9 ratio of persons per vehicle for work trips and 1.5 ratio for non-work trips. A total of 80 daily new vehicle-trips (40 entering/40 exiting) are estimated for the general office use. Of these trips, 14 are estimated to entering in the morning peak hour, and 16 are estimated to be exiting in the afternoon peak hour.

Medical Office Space

For the proposed 25,000 square feet of medical office space it was assumed that a higher trip generation would occur than for general office use. Based on MASCO projections it was determined that tenants would likely include medical research tenants rather

than a typical physicians building. Vehicle-trip rates were derived from standard ITE[2] office use rates, with the same transit share and vehicle occupancy factors assumed as for general office use components (see above). Estimated daily vehicle-trips for the medical office space would total 198 daily vehicle-trips (99 entering/99 exiting). During the morning peak hour, 33 entering trips are estimated, while 40 exiting trips are estimated for the afternoon peak hour.

Retail Space

Trips associated with the retail space of the proposed development, 20,000 square feet, are based on ITE rates reduced for LMA user characteristics, as derived from a recent study for a similar use at the Galleria project.[3] The survey found the percentage of actual trips to the retail use to include only 5 percent by auto. Therefore, a total of 118 daily new vehicle-trips (59 entering/59 exiting) are estimated for the retail use. These represent a conservative estimate and actual trips will likely be less depending upon the type of retail activity and its orientation to walk-in patrons. Based on these estimates, however, only 2 entering trips and 1 exiting trip are estimated to occur during the morning peak hour, while 7 entering trips are estimated to occur during the afternoon peak hour. The morning trips represent work trips, and the afternoon trips include primarily retail patronage.

2/ Trip Generation Rates, International Transportation Engineers.
3/ Longwood Galleria Project Traffic Impacat Study, Vanasse/Hangen, Inc., June 1985.

Child Care Center

The proposed child care facility use of 7,500 square feet will be built to support up to 150 children. Trip generation associated with the child care facility includes employee and child care drop-off trips. From a discussion with the Director of the LMA Child Care Center, presently located at Short Street, characteristics of arrivals and departure were determined in order to estimate daily vehicle-trips. Based on these current characteristics, trips for the child care facility, assuming capacity use, would total 422 daily vehicle-trips (211 entering/ 211 exiting). The amount of peak hour vehicle-trips for the child care center include an estimated 63 entering and 56 exiting trips occurring in the morning peak hour, and 56 entering and 63 exiting trips during the afternoon peak hour. These peak hour trips primarily represent temporary stopping in the drop-off loop and the majority would not enter the parking garage (note: the site plan illustrated in the Appendix.)

Delivery Vehicles and Taxi Trips

A proportion of the total daily vehicle-trip generation will consist of taxi and delivery vehicle-trips. Delivery vehicles are typically single-unit, two-axle vans, not semi-trucks. Based on the proposed development, the daily vehicle-trips associated with the office, retail and child care users are estimated to total 17 trips which are already reflected in the trip generation estimates. All of these trips are estimated to occur during the non-peak hours.

Table 5 summarizes the vehicle-trips generation for proposed building occupants. Overall, 818 new vehicle-trips are estimated to be generated by the expected building occupants.

TABLE 5
VEHICLE-TRIP GENERATION SUMMARY
BUILDING OCCUPANTS COMPONENT

Time Period	General Office Space	Medical Office Space	Retail Space	Child Care Center	Total
Daily*	80	198	118	422	818
AM Peak Hour					
In	14	33	2	63	112
Out	0	0	1	56	57
Total	14	33	3	119	169
PM Peak Hour					
In	0	0	0	56	56
Out	16	40	7	63	126
Total	16	40	7	119	182

* Includes total entering and exiting trips

Public Parking Component

The proposed garage will include 110 spaces for short-term public parking. It is assumed these spaces will have a 2.5 daily use ratio. Demand for these spaces will meet a portion of the needs of the building occupants non-employee trips already accounted for in the preceding sections, and provide additional parking for general public use. Additional trips associated with the general public component will likely be spread evenly throughout the day. For the purpose of this study, a conservative estimate of the peak hour trips attributable to the general public demand was made. Overall, trips associated with the general public parking demand not accounted for above will include 504 additional daily vehicle-trips (252 entering/252 exiting), with 25 entering trips and 13 exiting trips expected during the morning peak hour, and 13 entering and 25 exiting trips during the afternoon peak hour.

Table 6 summarizes the trip generation estimates for all components. Overall, the proposed project will generate an additional 1,942 daily vehicle-trips (971 entering/971 exiting) to the site. During the morning peak hour, a net increase of 243 entering trips and 70 exiting trips are estimated to occur, while during the afternoon peak hour, an additional 92 entering and 257 exiting trips are estimated to occur.

TABLE 6
VEHICLE-TRIP GENERATION SUMMARY
ALL COMPONENTS

	AM		PM		Daily		
	In	Out	In	Out	In	Out	Total*
Member Users Component	192	0	42	192	546	546	1,092
Building Occupants Component	112	57	56	126	409	409	818
Public Parking Component	25	13	13	25	252	252	504
Less (Existing Lot)	86	0	19	86	236	236	472
Net Increase	+243	+70	+92	+257	+971	+971	+1,942

* Includes all entering/exiting trips.

It is important to note vehicle-trips associated with the Temple Israel including daily work trips and drop-off trips are assumed to be included in the existing condition. These trips are not expected to increase as a result of the proposed project.

TRIP DISTRIBUTION

Based on recent studies[4] [5] of employees of the LMA, overall trip distribution patterns for new site-generated traffic were estimated. Table 7 summarizes the proportional share of traffic attributable to each geographic area in relation to the LMA.

TABLE 7

Geographic Area	Proportion of Generated Vehicle-Trips
North	19%
East	28%
South	24%
West	29%

TRIP ASSIGNMENT

The proportional distribution of new site trips estimated were assigned to entry routes to the LMA and roadways within the LMA. Existing traffic data and related studies were used to assign these trips to all likely routes accessing the site for both morning and afternoon peak periods. The following section details the impacts of these new vehicle-trips.

FUTURE CONDITIONS

There are several projects in the study area which are approved or under construction and are expected to be at or near completion by the time the proposed garage site is completed. These include:

- o Children's Hospital Research Expansion Project

4/ Transportation Alternatives for the Longwood Medical Area, First Principles, April 1985.

5/ Transportation Impact Study & Access Plan, Children's Hospital Research Expansion, Vanasse/Hangen, Inc., January 1985.

- Longwood Galleria Project on Children's Inn Site
- Harvard Medical School's Newe Teaching Facility (adjacent to Children's Hospital Hunnewell Building)
- Emmanuel College Parking Lot
- Dana Farber Facility
- Brigham and Women's ASBII and Parking Garage on Francis Street

These projects will add some traffic to study area roadways and intersections. Both the No-Build and Build conditions evaluated in the following sections assume traffic from these background projects. Figures 4 and 5 illustrate the intersection volumes for the No-Build conditions, which includes all existing traffic and the increases in traffic attributable to the background projects. For comparison, Figures 6 and 7 illustrate the intersection volumes for the project Build condition, which then adds project traffic to the No-Build condition.

TRAFFIC INCREASES

The relative change in traffic for the Build condition is presented for key study area intersections in Table 8. The greatest percentage increase in traffic will occur at the proposed site between Pilgrim Road and Plymouth Street, where traffic will increase by approximately 26 percent during the AM peak and by 23 percent during the PM peak without traffic mitigation. Longwood Avenue, as it enters the Town of Brookline, shows an increase in traffic by 6 percent in the AM peak and 7 percent in the PM peak.

The only other significant increases in traffic will occur on Longwood Avenue east of Brookline Avenue. For example, at the approach to Huntington Avenue east of Avenue Louis Pasteur, traffic will increase by 9.1 percent during the AM peak, and

No-Build
A.M. Peak Hour
Traffic Volumes

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Not to Scale

Fig. 4

No-Build P.M. Peak Hour Traffic Volumes

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Fig. 5

Build
A.M. Peak Hour
Traffic Volumes

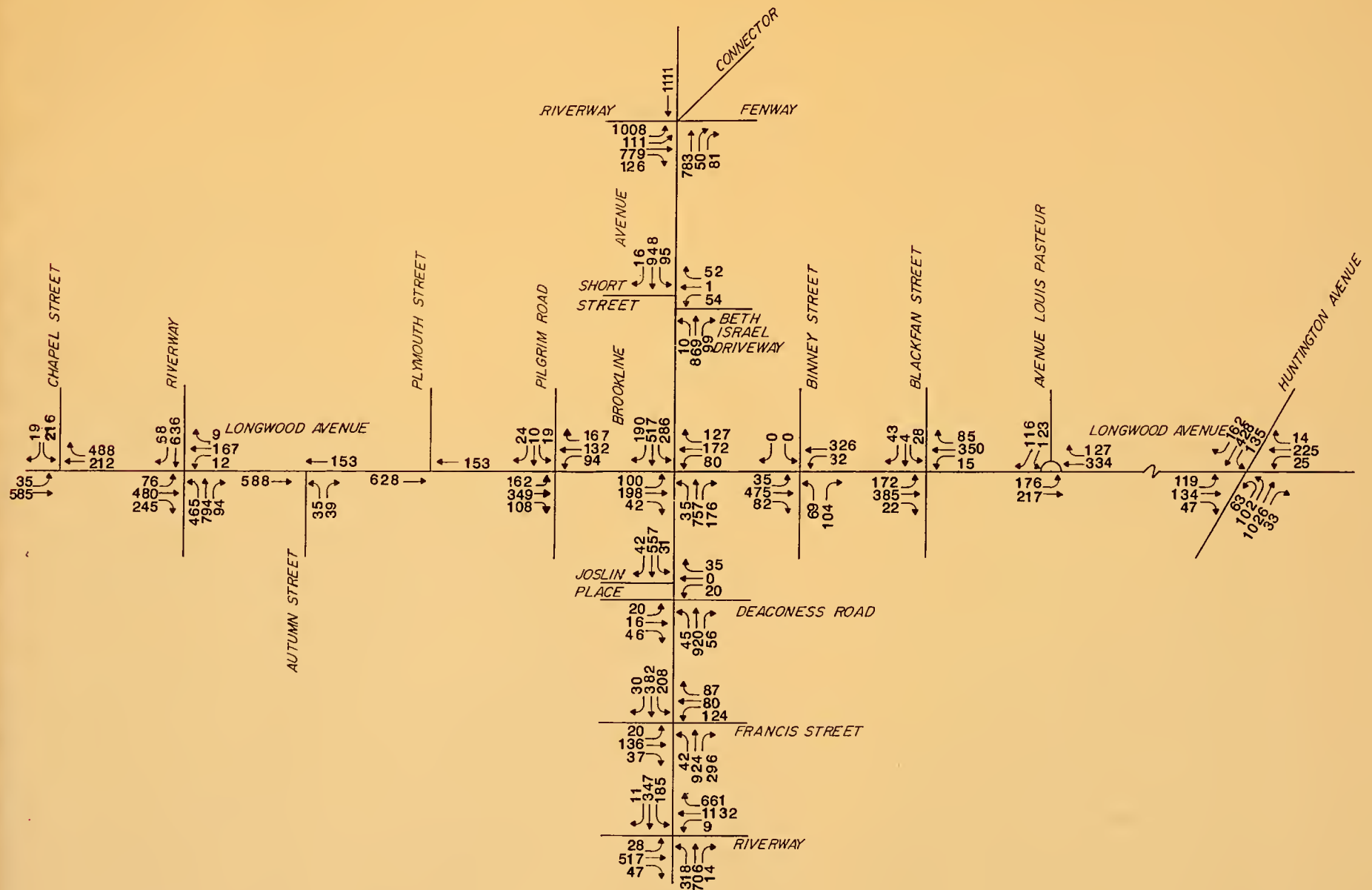

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Fig. 6

Build
P.M. Peak Hour
Traffic Volumes

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Not to Scale

Fig. 7

increase by 10 percent during the PM peak hour without traffic mitigation.

It is important to note that the Build future condition assumes a garage exit at Plymouth Street onto the Riverway for right turn only (northbound) traffic. This is discussed in more detail in the section under traffic mitigation. (The site plan included in the Appendix does not show this exit.)

TABLE 8
PROJECT TRAFFIC INCREASES

	AM Peak			PM Peak		
Location	No-Build Volume	Build Volume	Percent Increase	No-Build Volume	Build Volume	Percent Increase
Longwood Ave. west of the Riverway	1,410	1,501	6.4%	1,425	1,526	7.0%
Longwood Ave. between Pilgrim Rd. and Plymouth St.	631	795	25.9%	649	798	22.9%
Longwood Ave. east of Avenue Louis Pasteur	734	801	9.1%	773	851	10.0%
Brookline Ave. north of Short St.	1,920	1,957	1.9%	1,988	2,002	0.7%
Brookline Ave. south of Francis St.	1,908	1,938	1.5%	1,986	2,027	20%
Fenway (EB) west of Brookline Ave.	1,989	2,015	1.3%	1,675	1,741	3.9%
Riverway south of Longwood Ave.	2,201	2,242	1.8%	2,174	2,204	1.3%
Riverway north of Longwood Ave.	1,598	164	1.4%	1,721	1,730	0.4%

INTERSECTION PERFORMANCE ANALYSIS

Traffic Operation Measures

Level of service (LOS) is a term used to denote the operating conditions on a roadway and is qualitatively measured as the effect of speed, delay, freedom to maneuver and safety. At Level of Service "A", an intersection operates at free-flow conditions. Typically, the intersection approach appears quite open and turning movements are made easily. Seldom, if ever, does a driver have to wait through more than one red signal indication.

Capacity of the intersection occurs at Level of Service "E" and is characterized by consistent backups or queues of vehicles waiting to pass through the intersection. Capacity represents the maximum number of vehicles that can be processed during a given time frame. At capacity conditions, vehicles at signalized locations will always be waiting on approach roadways to use signal green time. In this situation, some motorists may experience significant delays. There are many intersections in the metropolitan Boston area which operate at or near capacity levels during peak demand periods.

There are several methods which may be applied for signalized intersection performance analyses, to yield a level of service rating. This study utilizes the Critical Movement Analysis procedures outlined in Transportation Research Circular 212, as published by the Transportation Research Board, Washington, D.C. The newest analysis tool in use is a software package based on the methodologies defined in the 1985 Highway Capacity Manual (Special Report 209, as published by the Transportation Research Board). The Critical Movement Analysis procedure was selected for use over the new software due to past acceptance of its use, and also due to the discovery of several serious flaws in the

calculation routines of the program when applied to study area intersections. Specific difficulties encountered included failure to account for the pedestrian phases correctly at several locations.

In the Critical Movement Analysis procedure, volume to capacity ratio is a term that is used to quantify the level of service ranges. It compares the volume actually being processed through an intersection to the theoretical maximum capacity of the location. The capacity is equal to the maximum sum of critical volumes associated with Level of Service "E". Basic level of service criteria are shown in Table 9. For each individual intersection, these critical-volume criteria were reduced by the percent of cycle time allocated to exclusive pedestrian phases. In the analysis of the Brookline Avenue/Riverway intersection these critical volume criteria were increased due to a higher saturation flow rate associated with the Riverway.

TABLE 9
LEVEL OF SERVICE CRITERIA
FOR SIGNALIZED INTERSECTIONS*

Level of Service	Maximum Sum of Critical Volumes			Typical Volume/ Capacity Ratio
	Two Phase	Three Phase	Four or More Phases	
A	900	855	825	0.00-0.60
B	1,050	1,000	965	0.61-0.70
C	1,200	1,140	1,100	0.71-0.80
D	1,350	1,275	1,225	0.81-0.90
E	1,500	1,425	1,375	0.91-1.00
F	- - - - Not Applicable - - - -			Varies

* Transportation Research Board, Transportation Research Circular Number 212, Interim Materials on Highway Capacity, Washington, D.C., January, 1980. (Planning Criteria)

Unsignalized intersections are defined by "Available Reserve Capacity." For these facilities, the major roadway is assumed to have the right-of-way and each individual movement on the side street (right, left, or through) is analyzed for its maximum capacity based on approach volumes on the major roadway. The actual volume being processed for each movement is compared to its calculated capacity. The difference between capacity and actual demand is defined as the available reserve capacity and is used as the criterion for determining level of service. Each level of service is associated with a range of available reserve capacities, as shown in Table 10. The higher the available reserve capacity, the better the level of service. The available reserve capacity and level of service values associated with an unsignalized intersection normally apply to the most critical movement at that location (i.e., the one with the least amount of reserve capacity).

TABLE 10
LEVEL OF SERVICE CRITERIA FOR
UNSIGNALIZED INTERSECTIONS

Reserve Capacity	Level of Service	Expected Delay to Minor Street Traffic
400 or more	A	Little or no delay
300 to 399	B	Short traffic delays
200 to 299	C	Average traffic delays
100 to 199	D	Long traffic delays
0 to 99	E	Very long traffic delays
*	F	*

* When demand exceeds capacity, severe congestion may result and affect other traffic movements.

Source: Transportation Research Board, 1985 Highway Capacity Manual, Special Report 209, Washington, D.C., 1985.

For the purposes of this analysis, the unsignalized analysis program included in the 1985 Highway Capacity Manual software was utilized.

Capacity Analysis

Ten signalized and two unsignalized intersections were analyzed as part of this study utilizing the techniques previously described. Table 11 summarizes the results of the capacity analyses for all intersections for Existing, No-Build and Build conditions.

Currently, 8 of the 12 locations operate at an acceptable level of service, between "A" and "D", in the morning and evening peak hours, with the intersection composite varying between the two peak hours. Two locations operate at deficient levels of service in both of the peak hours: Longwood Avenue/Riverway and Brookline Avenue/Riverway. This occurs primarily due to the sheer volume of through traffic on the Riverway, which ranges from 1,400 to 1,600 vehicles per hour (vph) in both directions.

In general, the four major intersections located around the periphery of the study area experience deficient operating conditions in either the morning or evening peak hour, as does the pivotal intersection at the center of the study area: Longwood Avenue/Brookline Avenue. Not surprisingly, each of these locations occurs at the intersection of any two of the four major roadways located within the study area: Longwood Avenue, Brookline Avenue, Huntington Avenue and the Riverway.

The intersection analysis of Brookline Avenue/Riverway yields extremely high volume to capacity (V/C) ratios in the morning peak hour. In actuality, the intersection operates at near capacity (V/C = 1.00). Several factors may be attributable to these results including the control of this intersection by a Metropolitan District Commission (MDC) police officer during the morning peak period. His direction enables him to optimize the

TABLE 11
INTERSECTION LEVEL OF SERVICE SUMMARY

	AM Peak Hour						PM Peak Hour					
	Existing		No-Build		Build		Existing		No-Build		Build	
	V/C*	LOS**	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS
SIGNALIZED LOCATIONS:												
Longwood Avenue/Chapel Street	0.52	A	0.52	A	0.57	A	0.56	A	0.57	A	0.61	B
Longwood Avenue/Riverway	1.03	F	1.04	F	1.09	F	1.00	F	1.01	F	1.07	F
Longwood Avenue/Brookline Avenue	0.83	D	0.85	D	0.90	D	0.96	E	1.00	E	1.02	F
Longwood Avenue/Blackfan Street	0.45	A	0.46	A	0.49	A	0.48	A	0.50	A	0.55	A
Longwood Avenue/Huntington Avenue	0.88	D	0.90	E	0.92	E	0.91	E	0.92	E	0.96	E
Brookline Avenue/Riverway***	1.17	F	1.19	F	1.20	F	0.94	E	0.95	E	0.95	E
Brookline Avenue/Francis Street	0.97	E	0.98	E	0.99	E	0.88	D	0.89	D	0.91	E
Brookline Avenue/Deaconness Road	0.44	A	0.44	A	0.45	A	0.48	A	0.48	A	0.51	A
Brookline Avenue/Beth Israel Drwy.	0.65	B	0.66	B	0.68	B	0.81	D	0.81	D	0.82	D
Brookline Avenue/Fenway	0.95	E	0.95	E	0.98	E	0.80	C	0.81	D	0.83	D
UNSIGNALIZED LOCATIONS:												
Longwood Avenue/Pilgrim Road	766	A	758	A	327	B	471	A	454	A	256	C
Longwood Avenue/Binney Street	311	B	285	C	254	C	338	B	288	C	249	C

* V/C = volume-to-capacity ratio for signalized locations; available reserve capacity (ARC) for unsignalized locations.
** LOS = Level of Service.
*** This location is controlled by a Metropolitan District Commission (MDC) police officer during the AM peak period.

1722/287/wpr

phasing of movements in addition to decreasing the total amount of movement time lost by vehicles starting-up at the beginning of the phase.

Under No-Build conditions, three intersections are projected to experience a decline in level of service in either of the peak hours. In the morning peak, Longwood Avenue/Huntington Avenue (LOS drops from "D" to "E") and Longwood Avenue/Binney Street (LOS drops from "B" to "C") will be affected by the addition of background traffic. During the evening peak hour, Brookline Avenue/Fenway (LOS drops from "C" to "D") and, again, the unsignalized Longwood Avenue/Binney Street (LOS drops from "B" to "C") are expected to decline in level of service, however, both will remain at an acceptable level of service.

Under Build conditions, project traffic is expected to cause only one intersection to decline from an acceptable level of service (LOS "A" through LOS "D") to an unacceptable level (LOS "E" or "F"). This will occur at Brookline Avenue/Francis Street in the evening peak hour, which is expected to experience a 4 percent increase in its V/C ratio (0.89 to 0.93). At this V/C ratio (LOS "E"), the intersection will still be operating at 7 percent under capacity. In the morning peak hour, only the unsignalized intersection at Longwood Avenue/Pilgrim Road will decline in level of service from LOS "A" to LOS "B". In the evening peak hour, four signalized and one unsignalized location are projected to decline in level of service, while only one location will decline to an unacceptable level, as previously noted.

ACCESS PLAN

A key element towards the realization of access plan goals will be the continued role performed by MASCO in its capability to plan, manage and implement a comprehensive transportation and parking program which meets the overall needs of the LMA. In this unique position, MASCO maintains a comprehensive perspective toward an improved transportation system in the area. Providing both transit and parking services, this role responds to area needs and requirements within a highly urbanized context.

In order to accommodate traffic related to the proposed garage development, several direct access goals are established, seeking to minimize traffic congestion, and to actualize improved level of service at key intersections. These access plan goals include:

- Discourage garage traffic use of Longwood Avenue, east of Brookline Avenue, particularly during the PM peak.

- Discourage garage traffic use of Brookline Avenue, particularly during the PM peak.

- Improve traffic operations at the key intersections of Brookline Avenue/Riverway and Longwood Avenue/Brookline Avenue.

- Improve the long-term traffic operations at the key intersection of Longwood Avenue and the Riverway.

- Encourage utilization of the higher capacity peripheral roadways.

- Encourage transit and shared-ride trips by building occupants.

DEMAND REDUCTION/MANAGEMENT STRATEGIES

MASCO as both the primary occupant of the office space in the proposed garage and as provider of parking and transportation services, will be in a leadership position to provide opportunity for vehicle-trip reduction. Trips by employees and visitors to the office, retail, and child care center can be reduced through direct programs to encourage ride-sharing, van-pooling, and transit utilization. The greatest singular opportunity related to trip reduction for this site would be the establishment of a commonality between child care drop-off trips and monthly parkers. For example, if 20 percent of the child care clientele were also monthly parkers, trips would be reduced by approximately 48 peak hour (total morning and afternoon) and 87 daily trips based on conservative estimates. MASCO, through its Transportation and Parking Management role, can influence the achievement of an objective to realize the common basis for these trips, while at the same time meeting its parking objectives.

MASCO currently provides carpool matching services for the entire LMA. The continuation of this effort from this new location will provide a direct service to building occupants. Overall LMA vehicle-trips associated both with this new garage and other locations can be reduced through discounts for higher vehicle occupancy and shared trip-making/parking space utilization.

Additionally, MASCO can use the garage spaces to provide a model case for peak hour trip reduction in a program which encourages alternative work schedules resulting in early arrival and later departures by occupant users. This will result in peak hour trip reduction, spreading the trips over a more even distribution of hours.

Public transportation passes and continued involvement by MASCO in the provision of shuttle bus service will also serve building tenants directly. MASCO's presence in the proposed development will afford direct access to opportunity for trip reduction efforts.

TRANSPORTATION SYSTEMS MANAGEMENT (TSM)

Improved utilization of existing roadway capacity and signal systems can provide immediate improvements to operating level of service. MASCO has, in the past, demonstrated a commitment toward implementation of TSM improvements such as the Brookline Avenue signal upgrading project and improved signage of area roadways. In the analysis of the proposed garage site, several TSM measures have been identified as recommended traffic mitigation. The following paragraphs describe these various improvements.

- Prevent left turn exiting from the garage and drop-off loop onto Longwood Avenue during the evening peak period, encouraging north or northeast bound traffic to exit via the Riverway exit. This would reduce traffic on Longwood Avenue by 70 vehicles for the afternoon peak east of the proposed garage. The Plymouth Street exit onto The Riverway is included in the analysis of the Build condition as a necessary mitigation measure. This left turn prohibition would result in a higher utilization of the exit, providing traffic direct access to the highest capacity roadway (for right turn only) and lessen impacts on Longwood Avenue. Traffic increases on Longwood Avenue, with this mitigation measure, would show only a 1.4 percent afternoon peak hour volume increase versus the projected 10 percent increase as reported on Table 8 without the mitigation.

- Improve level of service at the Brookline/Riverway intersection by removal of on-street parking on both sides of the southern leg of Brookline Avenue at the Riverway. Approximately 20 spaces, 10 on each side, would be removed. This would provide an additional northbound approach lane for shared through/right traffic movement in addition to one through lane, and one exclusive left turn lane. Southbound traffic flow would also improve through designation of a shared through/right lane, through lane, and exclusive left turn lane. Currently, the perception of drivers of a narrow roadway, due to the parking, results in an operation which does not provide full lane utilization. The implementation of these measures would decrease the morning peak volume-to-capacity (V/C) ratio from 1.20 to 0.94 (Level of Service "F" to "E") versus Build conditions, while the evening peak V/C ratio would decline more significantly from 0.95 to 0.74 (LOS "E" to "C").

- Improve level of service at the Brookline Avenue/Longwood Avenue intersection by removal of on-street parking for both northbound and southbound approaches on Brookline Avenue. Approximately 20 spaces, 10 on each approach, would be removed. The implementation of these measures would decrease the morning peak volume-to-capacity (V/C) ratio from 0.88 to 0.81 (Level of Service remains at "D") versus Build conditions, and improve the evening peak V/C ratio from 1.02 to 0.94 (Level of Service "F" to "E") versus the Build condition.

- Enforce the existing on-street peak hour parking restriction for the south side of Longwood Avenue between the Riverway and Brookline Avenue. In conjunction with

the proposed roadway improvement for this portion as described below, traffic flow between these intersections would be able to better absorb garage entering and exiting vehicles during both peak periods.

PHYSICAL ROADWAY IMPROVEMENTS

An identified roadway improvement exists in the immediate block adjacent to the proposed site, Longwood Avenue between existing Pilgrim Road and Plymouth Street. Based on building setbacks on the south side of the roadway, an additional traffic lane is possible. Current roadway dimensions would allow for an additional lane with removal of on-street parking. Another option would be to widen the roadway approximately 8 feet and retain the parking on the south side of the street. This would provide a continuous left turn lane for vehicles to queue for entry into the proposed garage. Continuous traffic flow on Longwood Avenue would not be affected with this provision of a separate lane for garage bound vehicles.

POSSIBLE LONG-TERM PHYSICAL IMPROVEMENT

Improved level of service can be achieved at the intersection of Longwood Avenue and the Riverway by separating pedestrian and vehicle traffic. Provision of an exclusive pedestrian overpass, if design standards prove feasible, would allow for removal of a lengthy but necessary existing pedestrian phase at this signalized intersection. Level of service without the pedestrian phasing would show an improved condition from a V/C ratio of 1.09 to 0.94 (LOS "F" to "E") during the morning peak, and a V/C ratio improvement from 1.07 to 0.94 (LOS "F" to "E") during the evening peak hour. Due to the volume of approach traffic on the Riverway, additional signal timing improvements do not appear feasible at this location. The pedestrian bridge concept

warrants additional study in the current LMA study as a possible physical improvement which would both provide traffic mitigation and better accommodate pedestrian traffic to/from the LMA.

CONSTRUCTION MANAGEMENT

A component of the Access Plan is an effective series of measures designed to minimize traffic flow and safety impacts during the construction phase. Summarized below are several measures which will be incorporated into the construction management plan for the project. The details of the plan have yet to be worked out in a separate Traffic Maintenance Agreement with the City; however, they are expected to include the following:

- Establish construction site perimeter limits and access so as to maintain normal two-way vehicular traffic on Longwood Avenue.

- Secure fencing, staging and bracing around the project block, including sidewalks, to protect pedestrian traffic near the construction site. This will apply to the Longwood Avenue frontage.

- Plan and implement construction site access to limit trucking and deliveries via Pilgrim Road (only).

- Two travel lanes (one per direction) will be made available on the Longwood Avenue frontage at all times.

OTHER

Taxis

Taxi service can be accommodated well by the proposed site plan drop-off loop concept. Taxis waiting for riders would be removed from Longwood Avenue and any potential conflict with through traffic.

Bicycles

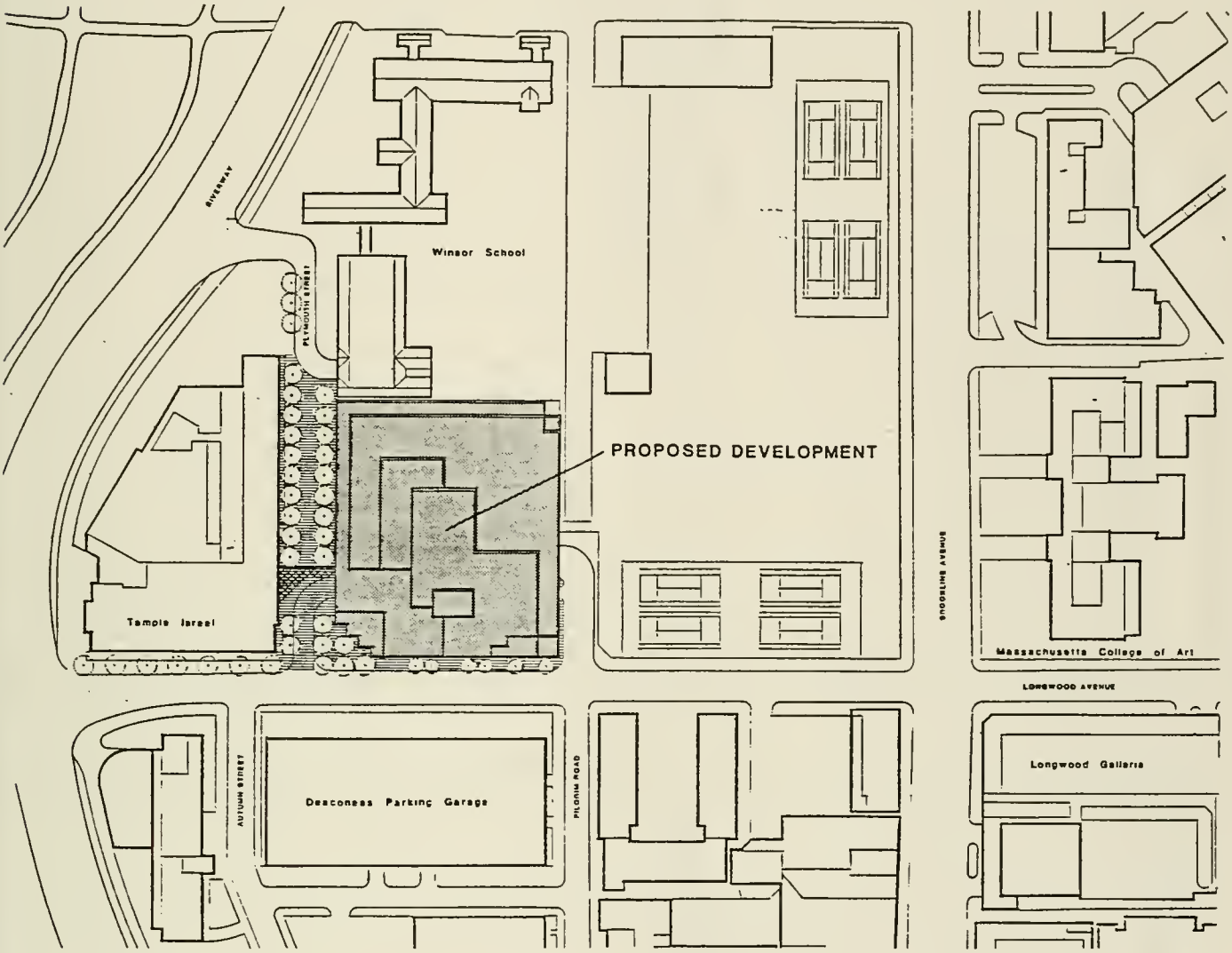
Space will be provided by MASCO in the proposed garage for daily secured bicycle parking on the first floor. Demand will be assessed and additional space provided as needs arise.

The current Manager of Transportation and Parking for MASCO will serve as the coordinator of these transportation and parking strategies. All efforts will be made to address issues, ideas and needs related to the proposed site use.

ACCESS MONITORING

Monitoring of actual trips generated by the proposed development will allow further opportunity for both demand reduction and TSM measures. MASCO will provide continual assessment of actual traffic and occupancy use of the building. Monthly reports will be made available providing information regarding the development performance and strategies to minimize traffic impacts. This will allow estimates to be verified and account for the accuracy of the projections.

APPENDIX



Vanasse Hangen Brustlin, Inc.
Consulting Engineers & Planners
60 Birmingham Parkway, Boston, MA 02135

1" = APPROX 170'

Site Development Plan

HOURLY, 2 CHANNEL VEHICLE COUNT

REFERENCE: LGWDAY 1599 CORRECTION FACTOR: 1.00

LOCATION : LONGWOOD AVE BETWEEN BROOKLINE AVE AND BINNEY ST

WEATHER : CLOUDY/RAINY

OPERATOR : AWB

FILENAME: LGWDAY

WEEK OF MONDAY 11 / 17 / 8[illegible]

	MONDAY 17		TUESDAY 18		WEDNESDAY 19		THURSDAY 20		FRIDAY 21		SATURDAY 22		SUNDAY 23		WEEKDAY AVERAGE	
[illegible]S	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N
AM	*	*	*	*	*	*	*	*	26	219	*	*	*	*	26	219
	*	*	*	*	*	*	*	*	17	128	*	*	*	*	17	129
	*	*	*	*	*	*	*	*	8	110	*	*	*	*	8	110
	*	*	*	*	*	*	*	*	8	53	*	*	*	*	8	53
	*	*	*	*	*	*	*	*	10	47	*	*	*	*	10	47
	*	*	*	*	*	*	*	*	4	122	*	*	*	*	4	122
	*	*	*	*	*	*	*	*	121	461	*	*	*	*	121	461
	*	*	*	*	*	*	*	*	459	368	*	*	*	*	459	368
	*	*	*	*	*	*	*	*	480	370	*	*	*	*	480	370
	*	*	*	*	*	*	*	*	511	368	*	*	*	*	511	363
	*	*	*	*	*	*	*	*	422	419	*	*	*	*	422	419
	*	*	*	*	*	*	345	422	*	*	*	*	*	*	345	422
PM	*	*	*	*	*	*	336	524	*	*	*	*	*	*	336	524
	*	*	*	*	*	*	465	454	*	*	*	*	*	*	465	454
	*	*	*	*	*	*	331	468	*	*	*	*	*	*	331	468
	*	*	*	*	*	*	359	545	*	*	*	*	*	*	359	545
	*	*	*	*	*	*	404	456	*	*	*	*	*	*	404	456
	*	*	*	*	*	*	380	425	*	*	*	*	*	*	380	425
	*	*	*	*	*	*	420	492	*	*	*	*	*	*	420	492
	*	*	*	*	*	*	267	524	*	*	*	*	*	*	267	524
	*	*	*	*	*	*	110	572	*	*	*	*	*	*	110	572
	*	*	*	*	*	*	91	556	*	*	*	*	*	*	91	556
	*	*	*	*	*	*	65	491	*	*	*	*	*	*	65	491
	*	*	*	*	*	*	37	333	*	*	*	*	*	*	37	333
	*	*	*	*	*	*	3619	6262	2066	2665	*	*	*	*	5676	8927

COMBINED TOTALS

*	*	*	*	245	*	*	245
*	*	*	*	145	*	*	145
*	*	*	*	118	*	*	118
*	*	*	*	61	*	*	61
*	*	*	*	57	*	*	57
*	*	*	*	126	*	*	126
*	*	*	*	582	*	*	582
*	*	*	*	827	*	*	827
*	*	*	*	850	*	*	850
*	*	*	*	879	*	*	879
*	*	*	*	841	*	*	841
*	*	*	767	*	*	*	767
*	*	*	860	*	*	*	860
*	*	*	919	*	*	*	919
*	*	*	799	*	*	*	799
*	*	*	904	*	*	*	904
*	*	*	860	*	*	*	860
*	*	*	805	*	*	*	805
*	*	*	912	*	*	*	912
*	*	*	791	*	*	*	791
*	*	*	682	*	*	*	682
*	*	*	647	*	*	*	647
*	*	*	556	*	*	*	556
*	*	*	370	*	*	*	370
*	*	*	9572	4731	*	*	14303

VANASSE/HANSEN ASSOCIATES
15 MINUTE, 2 CHANNEL VEHICLE COUNT

REFERENCE: L6WDAV 1599 CORRECTION FACTOR: 1.00
LOCATION: LONGWOOD AVE BETWEEN ~~BROOKLINE~~ Brackton AVE AND BINNEY ST
WEATHER: CLOUDY/RAINY
OPERATOR: AWB

FILENAME: L6WDAV
THURSDAY 11 / 20 / 86

HOUR BEGINS	SB 0	SB 15	SB 30	SB 45	SB HOUR TOTAL	NB 0	NB 15	NB 30	NB 45	NB HOUR TOTAL	COMBINED TOTAL
AM											
12	*	*	*	*	*	*	*	*	*	*	*
1	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*
4	*	*	*	*	*	*	*	*	*	*	*
5	*	*	*	*	*	*	*	*	*	*	*
6	*	*	*	*	*	*	*	*	*	*	*
7	*	*	*	*	*	*	*	*	*	*	*
8	*	*	*	*	*	*	*	*	*	*	*
9	*	*	*	*	*	*	*	*	*	*	*
10	*	*	*	*	*	*	*	*	*	*	*
11	*	*	*	90	90	*	*	*	146	146	236
PM											
12	37	82	101	116	336	188	137	93	106	524	860
1	116	102	118	129	465	120	101	129	104	454	919
2	114	84	57	76	331	121	112	134	101	468	799
3	55	95	101	108	359	132	165	130	118	545	904
4	110	110	94	90	404	111	119	105	121	456	860
5	84	92	95	109	380	100	105	110	110	425	805
6	115	100	102	103	420	106	112	141	133	492	912
7	71	65	59	72	267	117	147	135	125	524	791
8	37	28	21	24	110	127	153	151	141	572	682
9	26	19	16	30	91	142	140	127	147	556	647
10	12	25	16	12	65	99	134	135	123	491	556
11	8	6	7	16	37	101	87	67	78	333	370
TOTALS					3355					5986	9341

AM PEAK HOUR IS 11:00 TO 12:00

	SB	NB	COMBINED
VOLUME	90	146	236
DIRECTIONAL SPLIT	38%	62%	
PEAK HOUR FACTOR	0.25	0.25	0.25

PM PEAK HOUR IS 3:15 TO 4:15

	SB	NB	COMBINED
VOLUME	414	524	938
DIRECTIONAL SPLIT	44%	56%	
PEAK HOUR FACTOR	0.94	0.79	0.90

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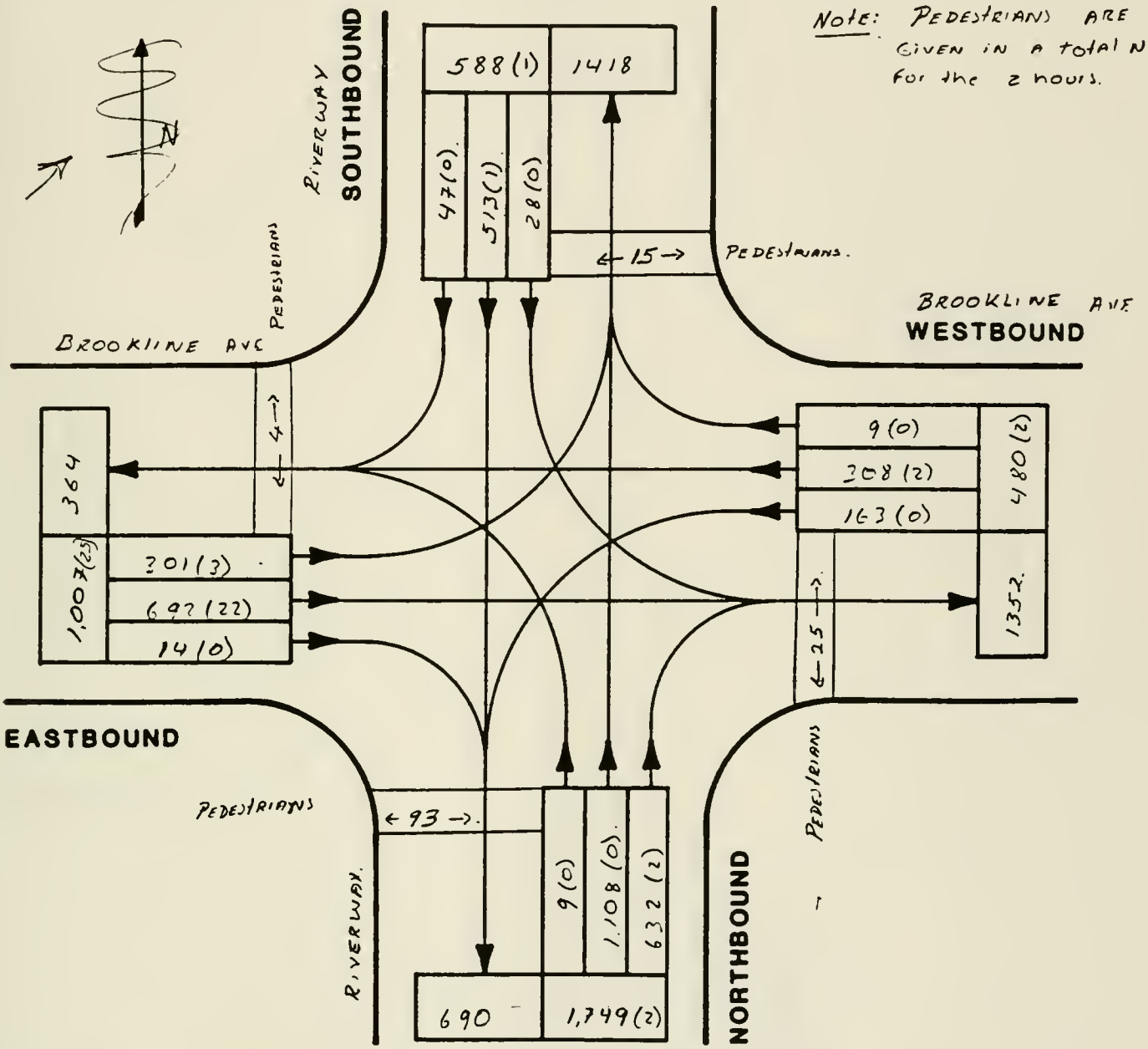
INTERSECTION TURNING MOVEMENT COUNT

CITY Boston, MA DATE 12/9/86 DAY of WEEK Tues.
INTERSECTION Brookline Ave / Riverway JOB No. 1098

Note: Pedestrians are given in a total numb
for the 2 hours.



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
RIVERWAY (SB)	588 (1)	15 %	7:30 - 8:30 AM
RIVERWAY (NB)	1,749 (2)	46 %	
BROOKLINE AVE (EB)	1,007 (25)	26 %	AM PEAK HOUR
BROOKLINE AVE (WB)	480 (2)	13 %	
			VEHICLES COUNTED
			ALL VEHICLES XXX 3824
			TRUCKS (XX) 30
TOTAL	3824 (30)	100 %	PERCENT TRUCKS .8 %

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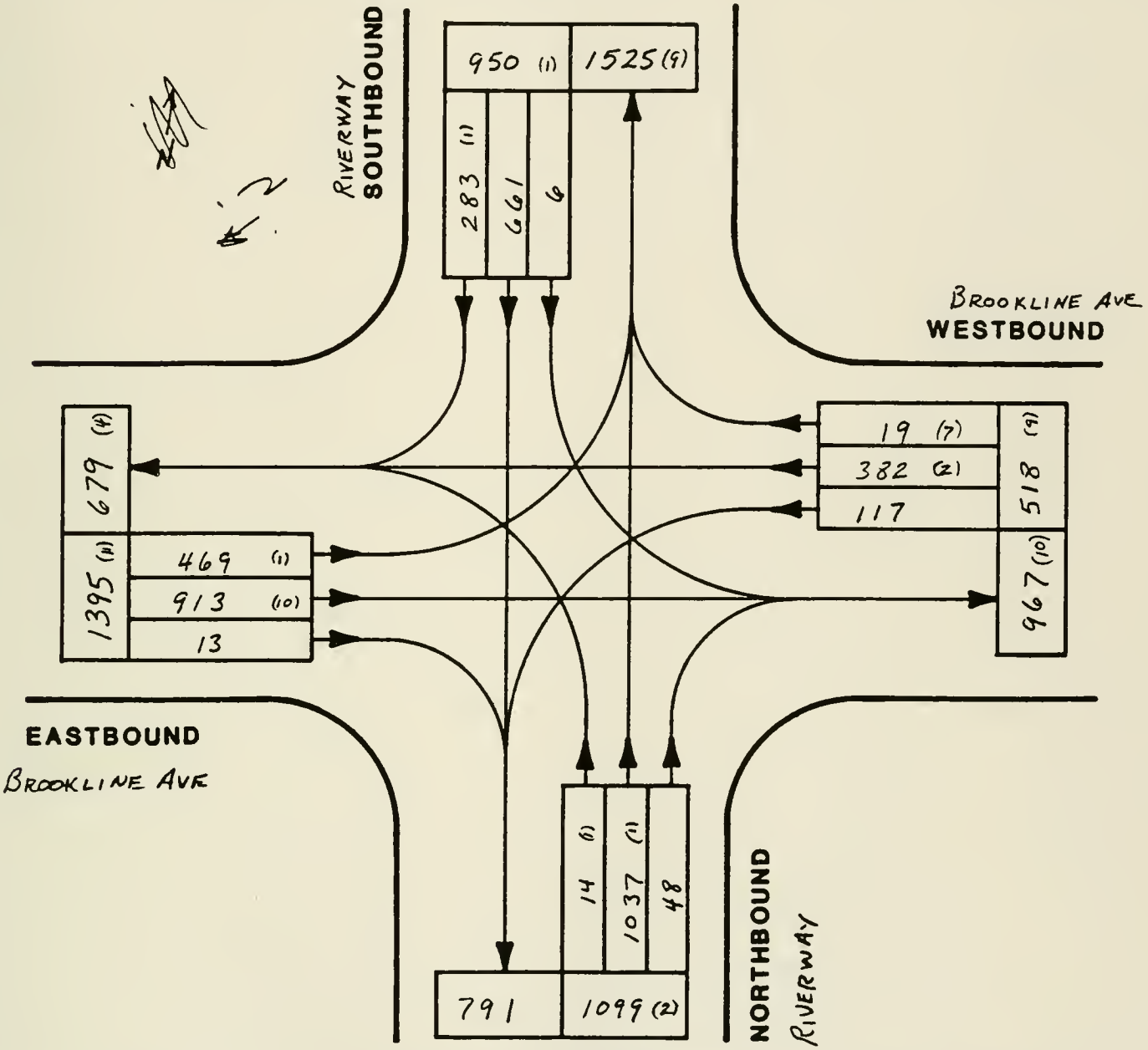
INTERSECTION TURNING MOVEMENT COUNT

CITY *BOSTON, MA* DATE *12/4/86* DAY of WEEK *THURSDAY*
INTERSECTION *BROOKLINE AVE / RIVERWAY* JOB No. *1098*



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
RIVERWAY (NORTHBOUND)	1099 (2)	27.7%	4:45 - 5:45 PM
RIVERWAY (SOUTHBOUND)	950 (1)	23.9%	
BROOKLINE AVE (EASTBOUND)	1395 (11)	35.2%	PM PEAK HOUR
BROOKLINE AVE (WESTBOUND)	518 (9)	13 %	
			VEHICLES COUNTED
			ALL VEHICLES XXX 3962
			TRUCKS (XX) 23
TOTAL	3962 (23)	100 %	PERCENT TRUCKS .5 %

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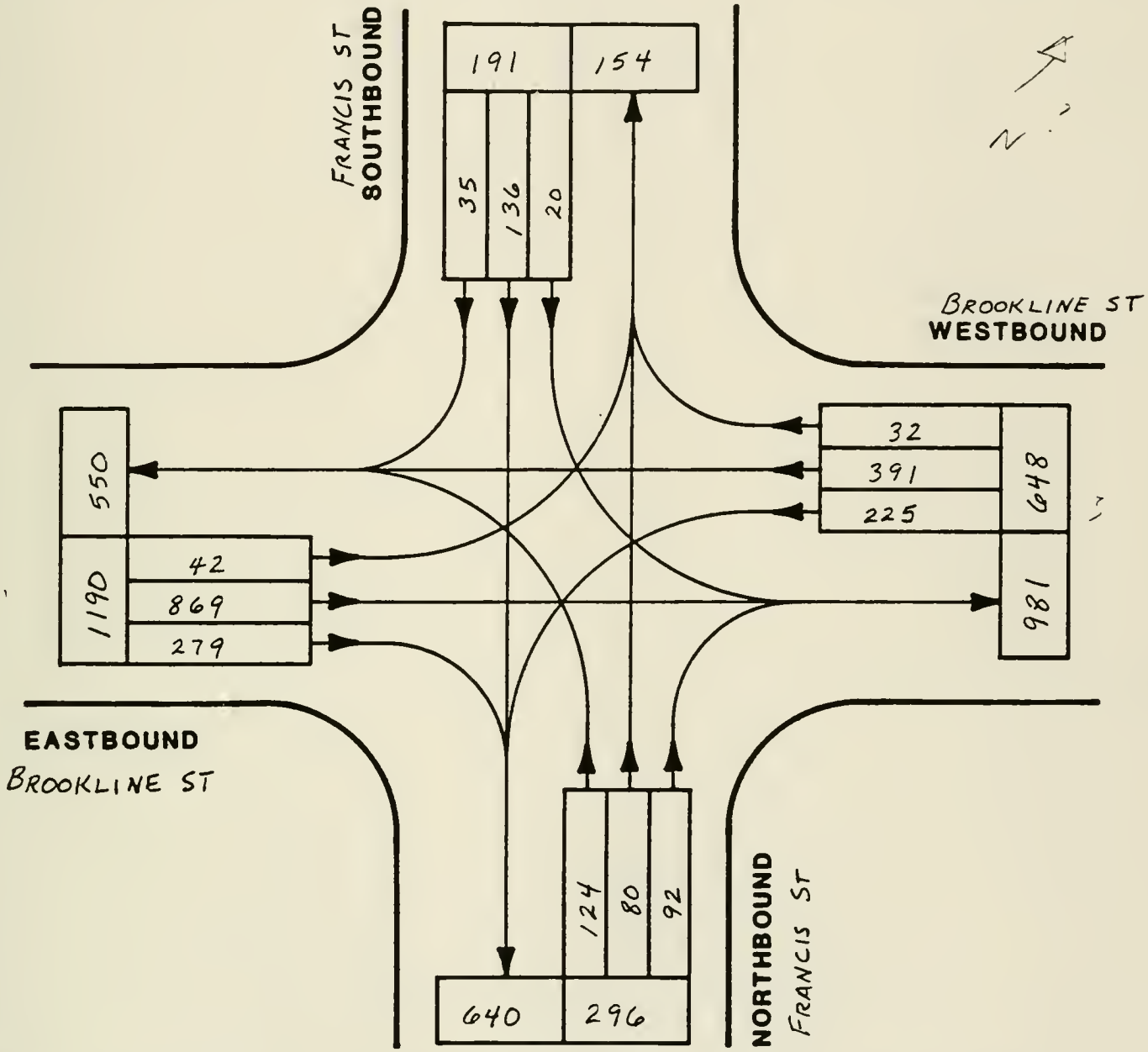
INTERSECTION TURNING MOVEMENT COUNT

CITY Boston, MA DATE 12/12/86 DAY of WEEK Friday
INTERSECTION Brookline Ave/Francis Street JOB No. 1098



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
FRANCIS STREET (NORTHBOUND)			7:45 - 8:45 AM
FRANCIS STREET (SOUTHBOUND)			
BROOKLINE ST (EASTBOUND)			AM PEAK HOUR
BROOKLINE ST (WESTBOUND)			
			VEHICLES COUNTED
			ALL VEHICLES XXX 2325
			TRUCKS (XX) 0
TOTAL			PERCENT TRUCKS 0 %

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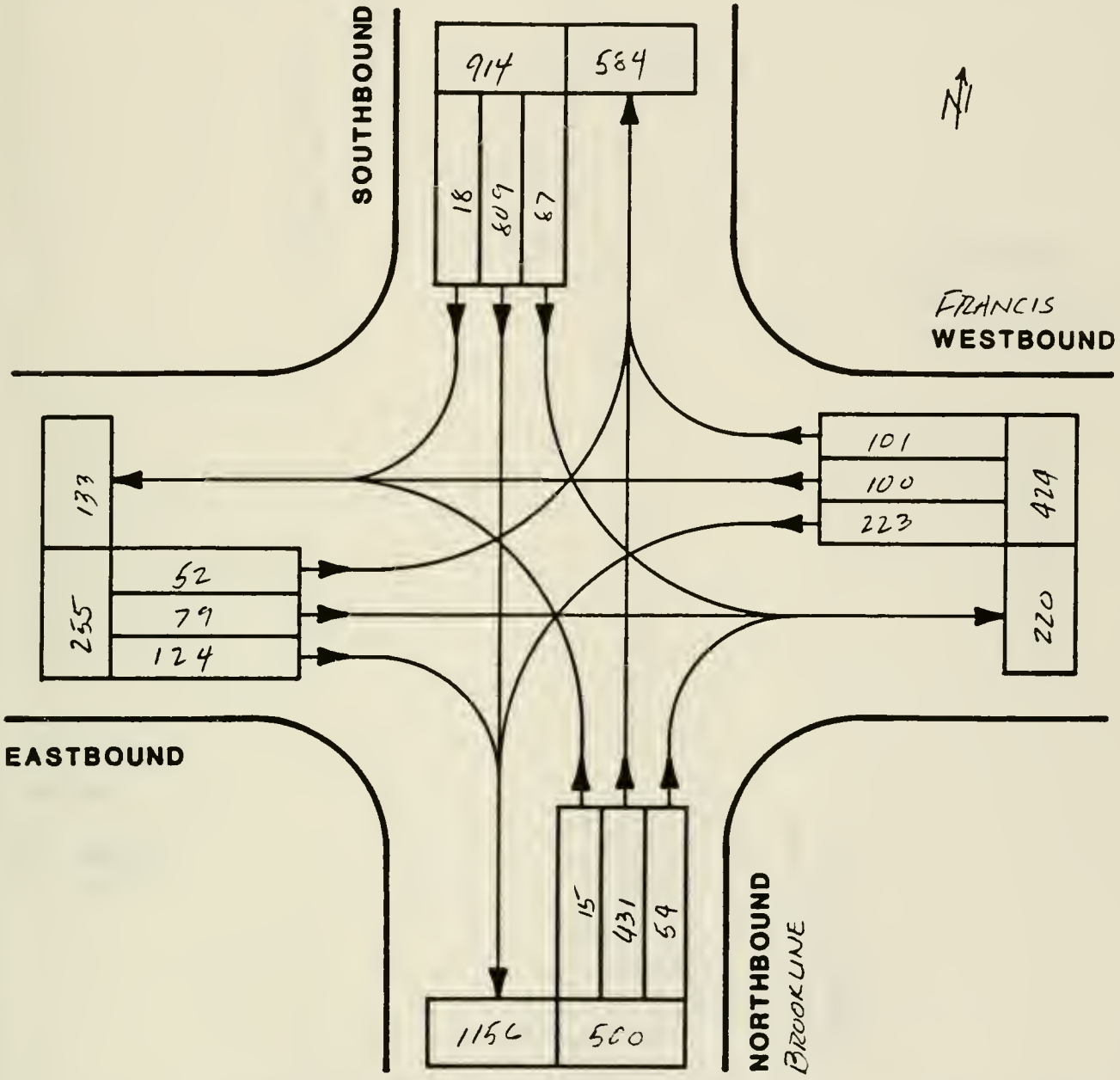
617/783-7000

INTERSECTION TURNING MOVEMENT COUNT

CITY Boston Mass. DATE 12/1-/86 DAY of WEEK TUES.
INTERSECTION BROOKLINE & FRANCIS JOB No. 1098



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
FRANCIS ST. EB	254	12%	4:45 - 5.45 PM
FRANCIS ST. WB	474	20%	
BROOKLINE AVE NB	590	24%	PEAK HOUR
BROOKLINE AVE. SB	914	44%	
			VEHICLES COUNTED
			ALL VEHICLES XXX 2093
			TRUCKS (XX)
TOTAL	2093	100	PERCENT TRUCKS %

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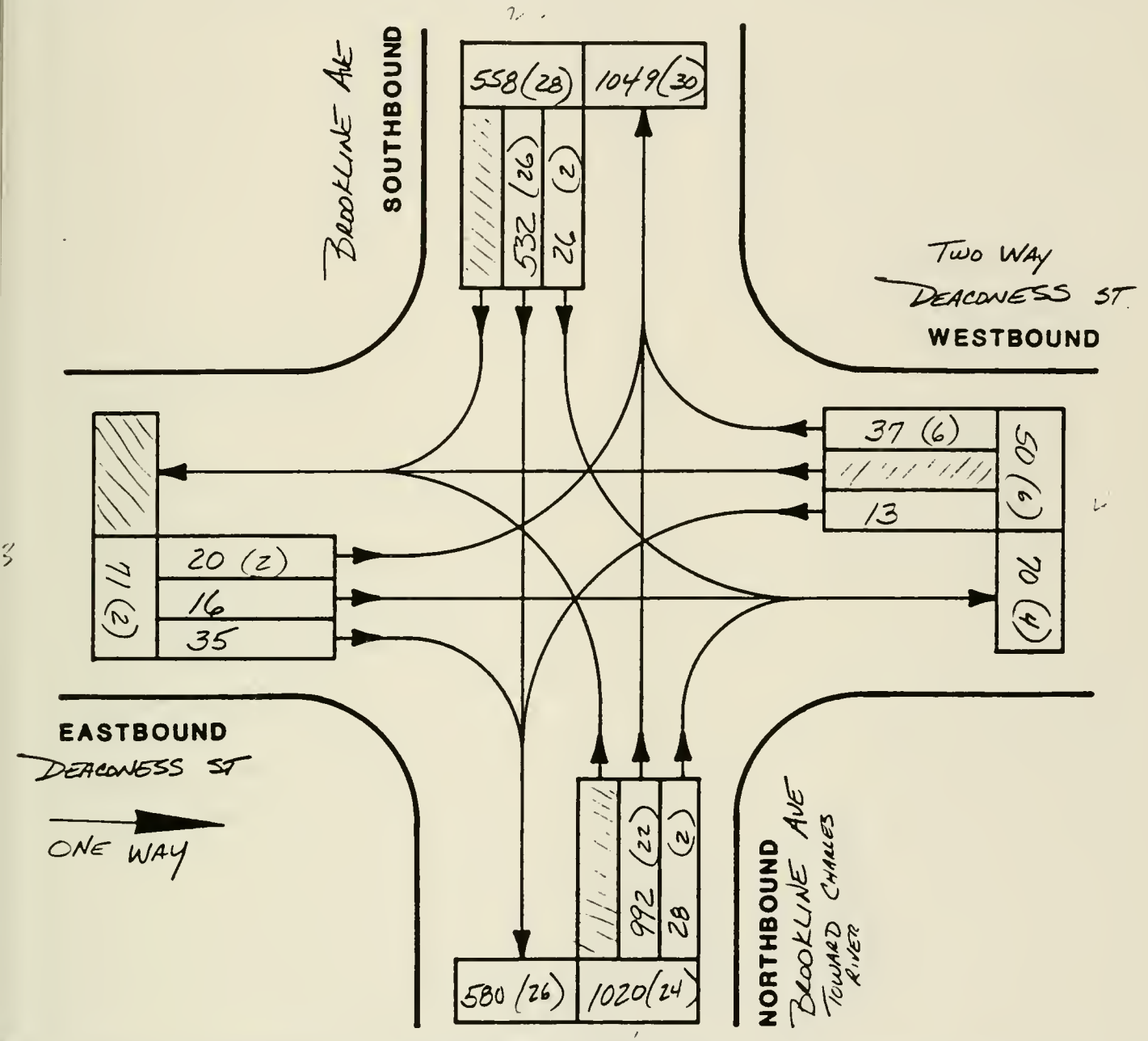
INTERSECTION TURNING MOVEMENT COUNT

CITY Boston, MA DATE 12/10/86 DAY of WEEK Wednesday
INTERSECTION Brookline : Deaconess JOB No. 1098



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Brookline Ave NB	1020 (24)	60	AM Peak Hr
Brookline Ave SB	558 (28)	33	
Deaconess St EB	71 (2)	4	7:45 - 8:45
Deaconess St WB	50 (6)	3	
			VEHICLES COUNTED
			ALL VEHICLES XXX 1699
			TRUCKS (XX) 60
TOTAL	1699 (60)	100	PERCENT TRUCKS 3.5 %

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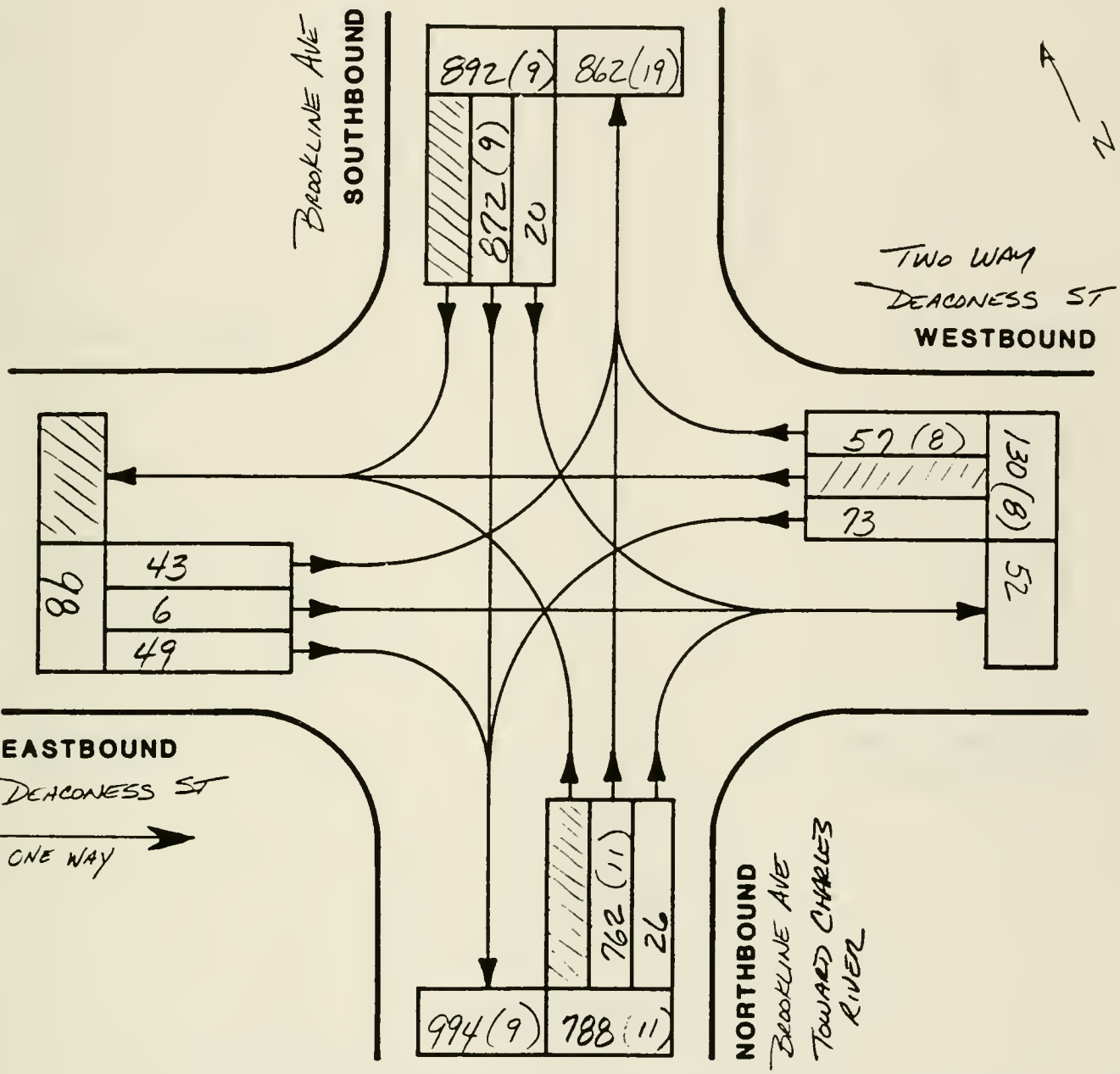
INTERSECTION TURNING MOVEMENT COUNT

CITY Boston MA DATE 12/9/86 DAY of WEEK Tuesday
INTERSECTION Brookline / Deaconess JOB No. 1098



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Brookline Ave NB	788 (11)	41	PM Peak Hr
Brookline Ave SB	892 (9)	47	
Deaconess St EB	98	5	4:45 - 5:45
Deaconess St WB	130 (8)	7	
			VEHICLES COUNTED
			ALL VEHICLES XXX 1908
			TRUCKS (XX) 28
TOTAL	1908 (28)	(1)	PERCENT TRUCKS 1.4 %

PHF = 71.9%

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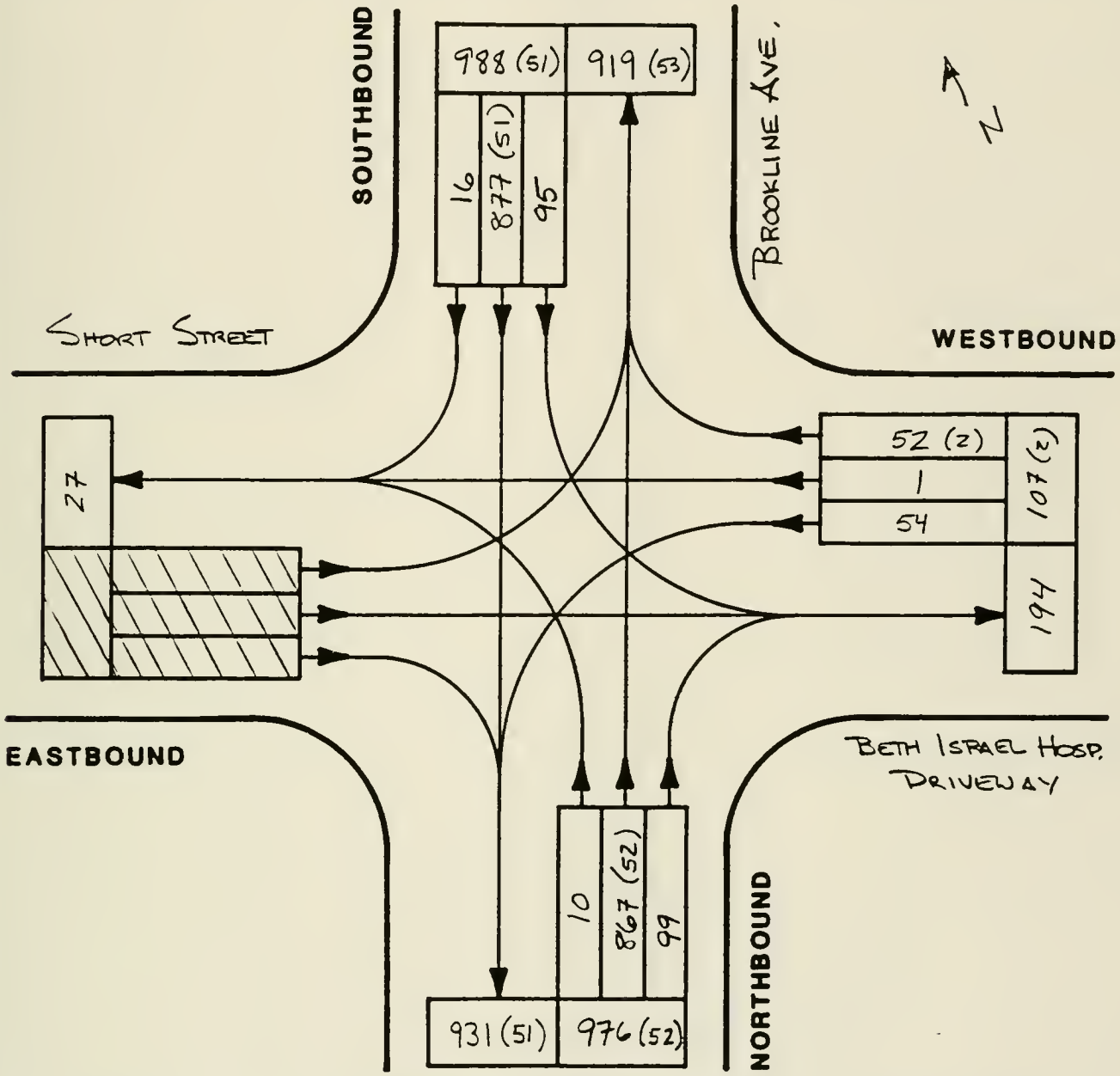
INTERSECTION TURNING MOVEMENT COUNT

CITY Boston, MA DATE 12/4/86 DAY of WEEK Thursday
INTERSECTION Brookline Ave / B.I. Driveway / Short St. JOB No. 1722



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Brookline Ave NB	976 (52)	47.1 %	7:30 - 8:30
Brookline Ave SB	988 (51)	47.7 %	
Beth Israel Drwy WB	107 (2)	5.2 %	AM Peak Hour
			VEHICLES COUNTED
			ALL VEHICLES XXX 2071
			TRUCKS (XX) 105
TOTAL	2071 (105)	100.0 %	PERCENT TRUCKS 5.1 %

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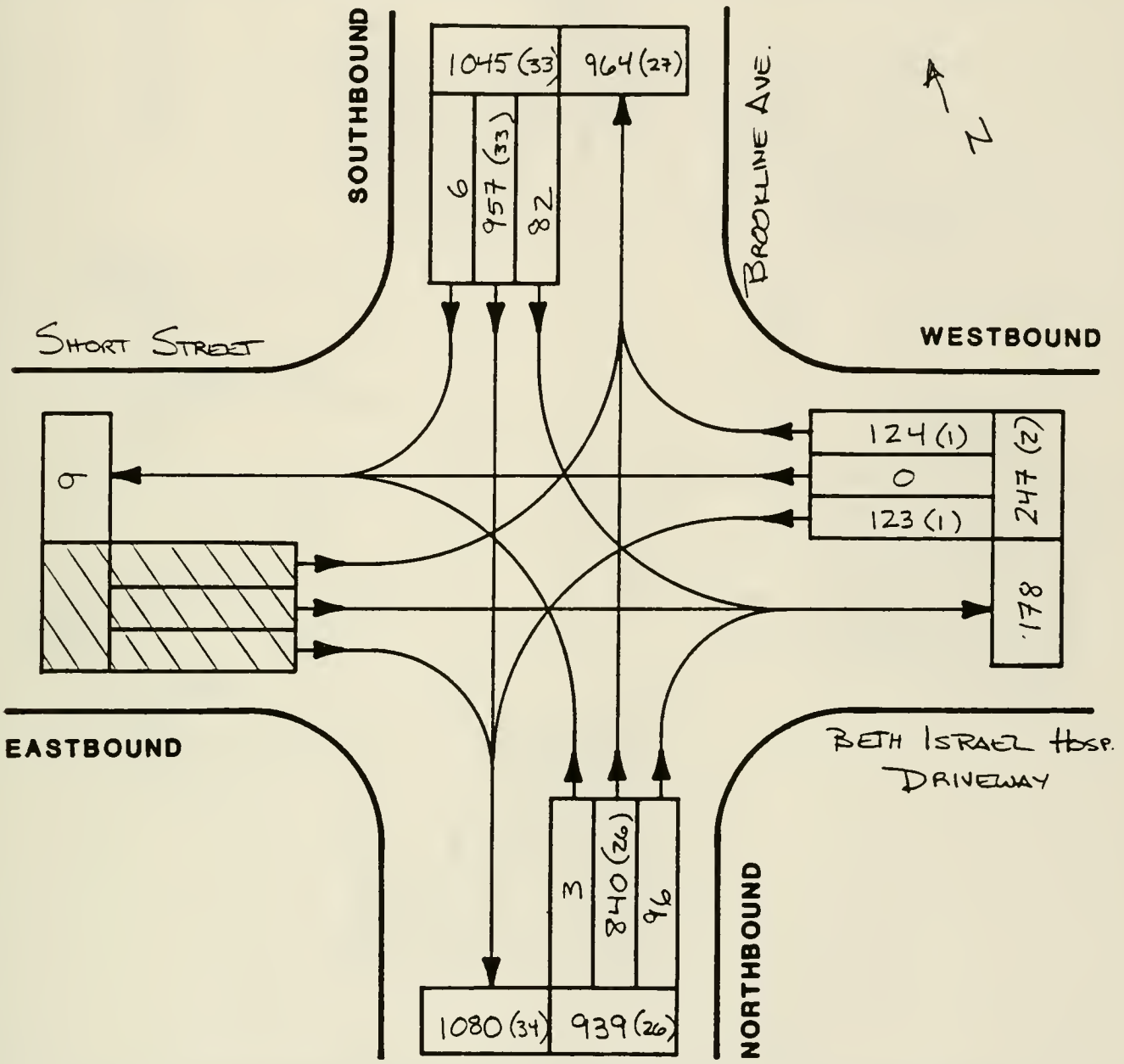
INTERSECTION TURNING MOVEMENT COUNT

CITY Boston, MA DATE 12/4/86 DAY of WEEK Thursday
INTERSECTION Brookline Ave/B.I Driveway/Short St. JOB No. 1722



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Brookline Ave NB	939 (26)	42.1 %	4:15 - 5:15
Brookline Ave SB	1045 (33)	46.8 %	
Beth Israel Drwy WB	247 (2)	11.1 %	PM Peak Hour
			VEHICLES COUNTED
			ALL VEHICLES XXX 2231
			TRUCKS (XX) 61
TOTAL	2,231 (61)	100.0 %	PERCENT TRUCKS 2.7 %

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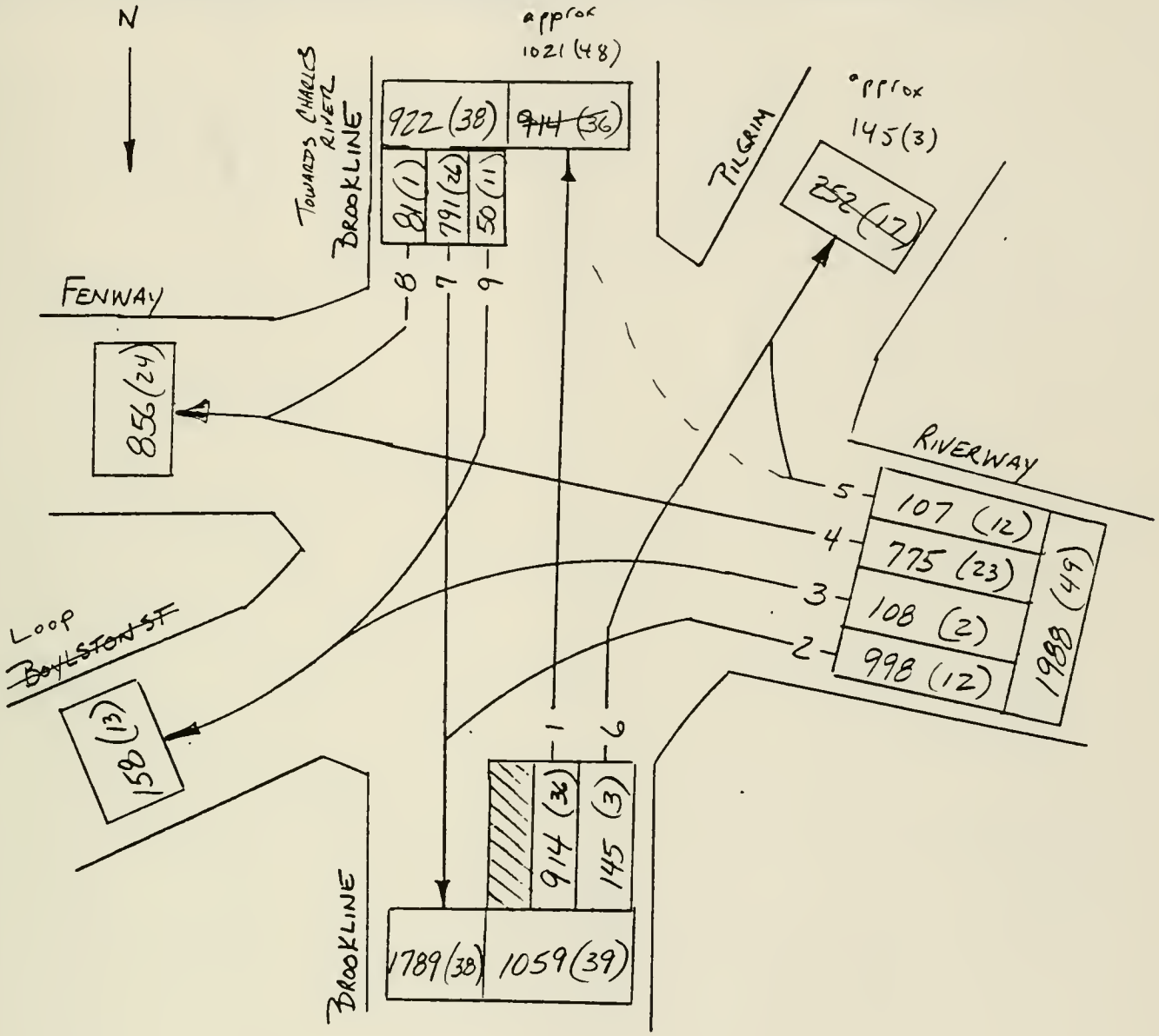
INTERSECTION TURNING MOVEMENT COUNT

CITY Boston Ma DATE 12/4/86 DAY of WEEK Thursday

INTERSECTION Brookline at Fenway JOB No. 1098



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Brookline Ave NB	922 (38)	23	AM Peak Hr
Riverway	1988 (49)	50	
Brookline Ave. SB	1059 (39)	27	7:45 - 8:45
			VEHICLES COUNTED
			ALL VEHICLES XXX 3169
			TRUCKS (XX) 126
TOTAL	3169 (126)	100	PERCENT TRUCKS 3.2 %

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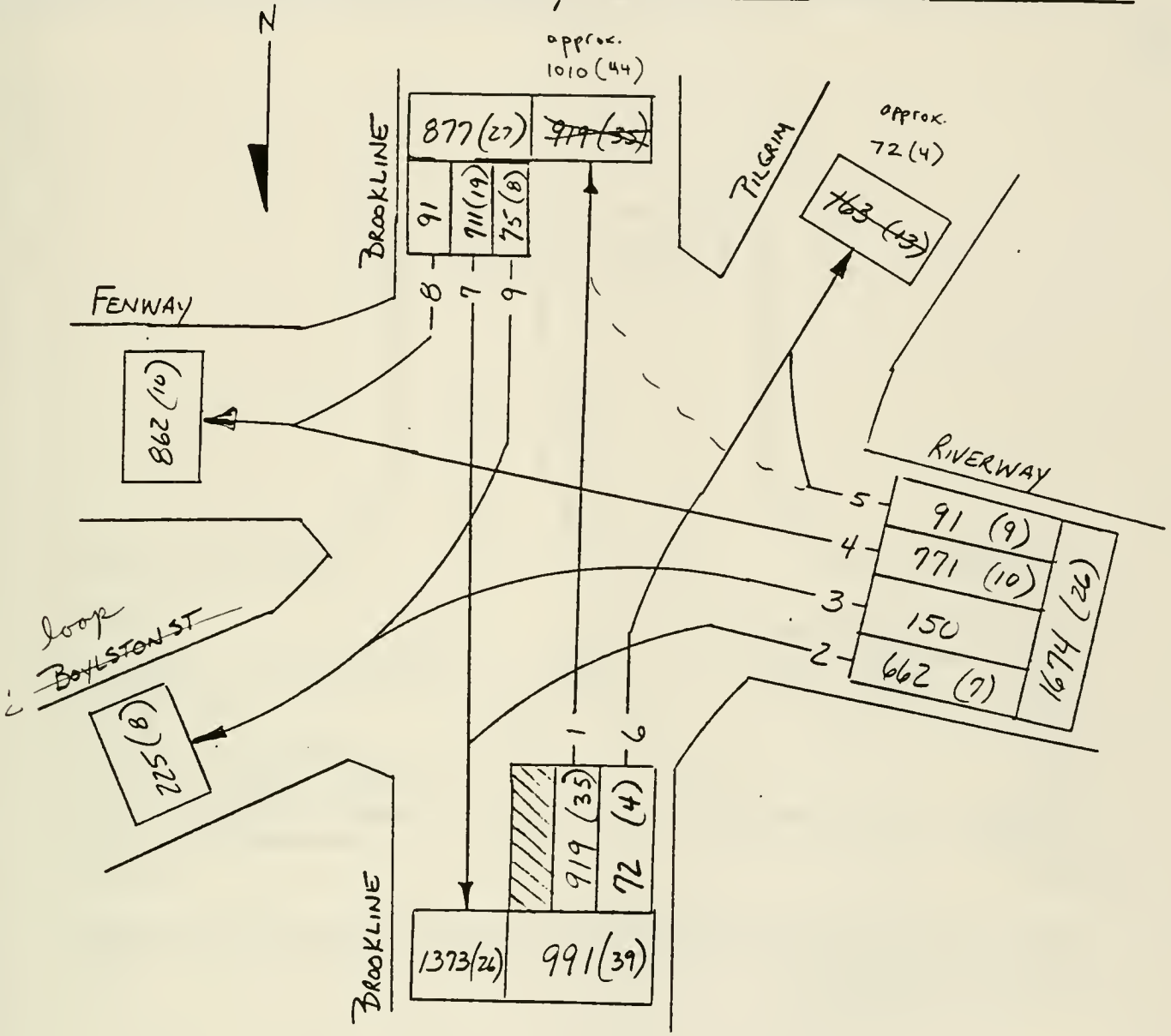
INTERSECTION TURNING MOVEMENT COUNT

CITY Boston MA DATE 12/3/86 DAY of WEEK WEDNESDAY

INTERSECTION Brookline at Fenway JOB No. 1098



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Brookline Ave NB	877 (27)	25	PM Peak Hr
Riverway	1674 (26)	47	
Brookline Ave SB	991 (39)	28	4:15 - 5:15
			VEHICLES COUNTED
			ALL VEHICLES XXX 3542
			TRUCKS (XX) 92
TOTAL	3542 (92)	100	PERCENT TRUCKS 2.6 %

P.C. - 2-49.

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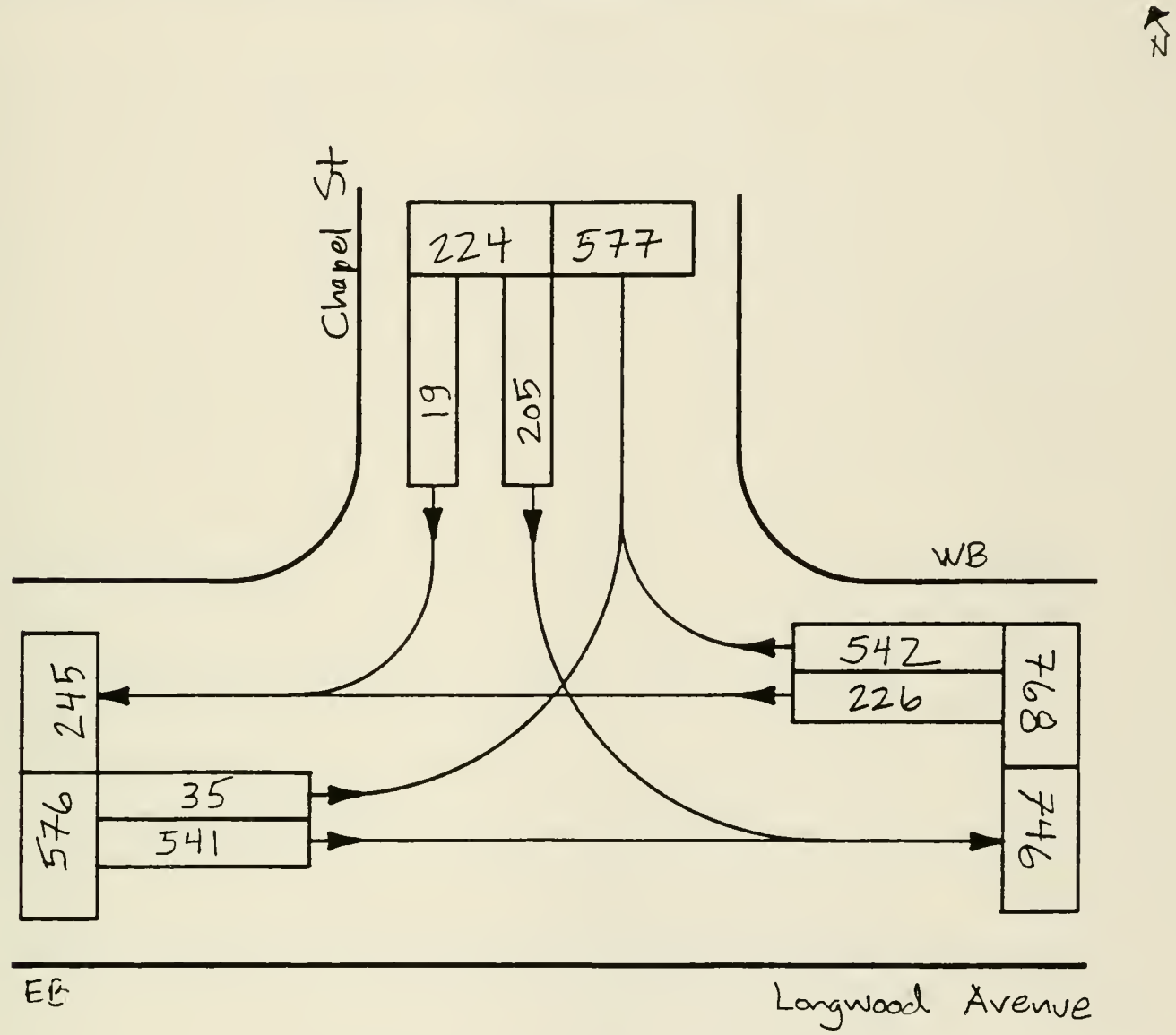
INTERSECTION TURNING MOVEMENT COUNT

CITY Brookline Ma. DATE 12/04/86 DAY of WEEK TUES
INTERSECTION Longwood Ave at Chapel St. JOB No. 1722



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Longwood Ave (EB)	576 (11)	36.7 %	7:45 – 8:45 AM
Longwood Ave (WB)	768 (5)	49.0 %	
Chapel Street (SB)	224 (1)	14.3 %	PEAK HOUR
			VEHICLES COUNTED
			ALL VEHICLES XXX 1568
			TRUCKS (XX) 17
TOTAL	1568 (17)	100 %	PERCENT TRUCKS 1.3 %

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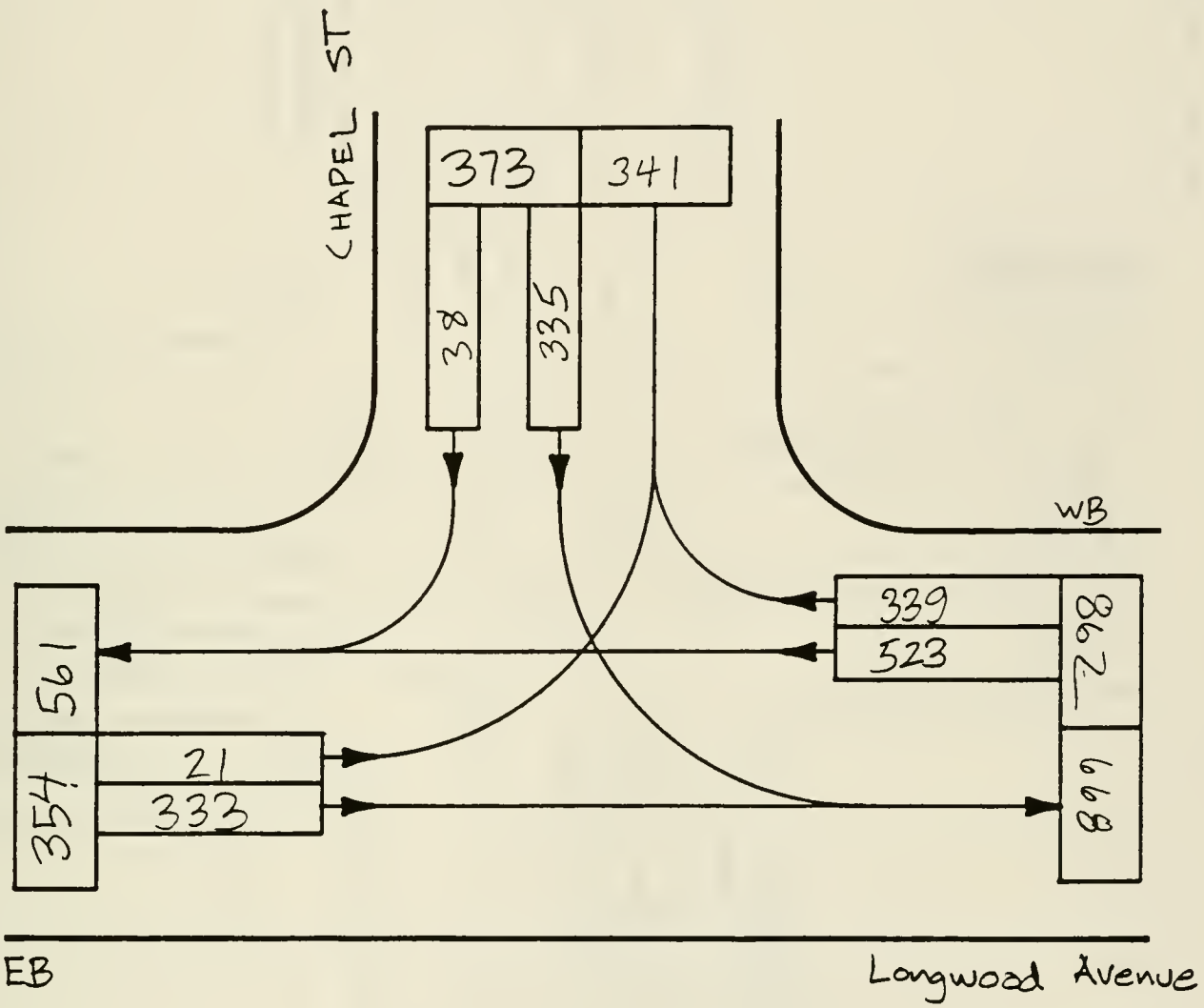
INTERSECTION TURNING MOVEMENT COUNT

CITY BROOKLINE MA. DATE 12/04/86 DAY of WEEK TUES
INTERSECTION Longwood Ave & Chapel St. JOB No. 1722



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Longwood EB	354 (4)	(22.3)%	5:00-6:00 PM
Longwood WB	862 (10)	(54.2) %	
Chapel St	373 (0)	(23.5)%	PEAK HOUR
			VEHICLES COUNTED
			ALL VEHICLES XXX 1584
			TRUCKS (XX) 14
TOTAL	1584 (14)	100 %	PERCENT TRUCKS .9 %

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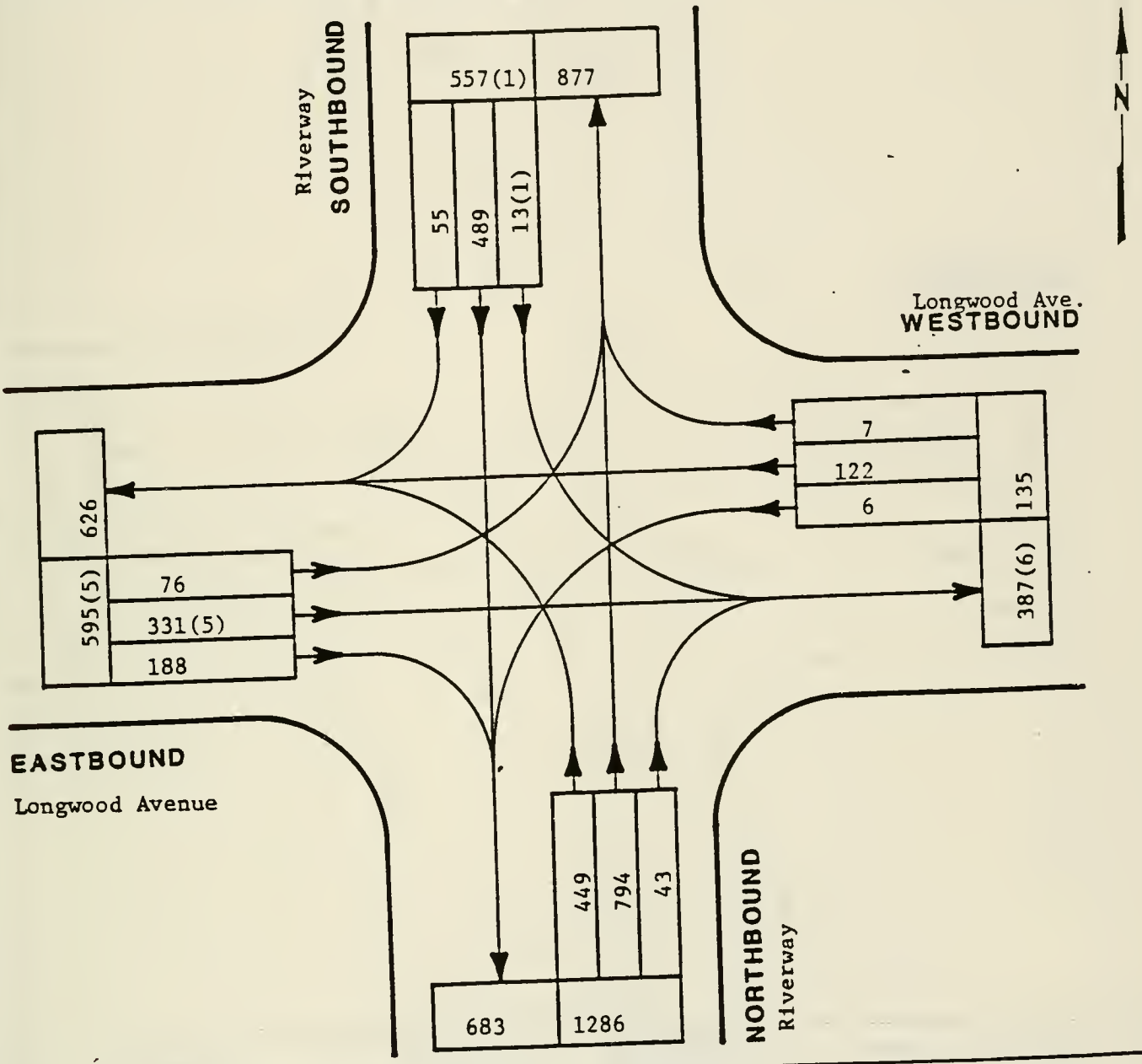
INTERSECTION TURNING MOVEMENT COUNT

CITY Boston, MA DATE 8/7/85 DAY of WEEK Wednesday
INTERSECTION Longwood Avenue/Riverway JOB No. 1098



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Riverway (NB)	1286	50%	
Riverway (SB)	557(1)	22%	7:45 - 8:45 AM
Longwood Ave. (EB)	595(5)	23%	
Longwood Ave. (WB)	135	5%	AM Peak Hour
			VEHICLES COUNTED
			ALL VEHICLES XXX 2573
			TRUCKS (XX) 6
TOTAL	2573(6)	100%	PERCENT TRUCKS 0.2 %

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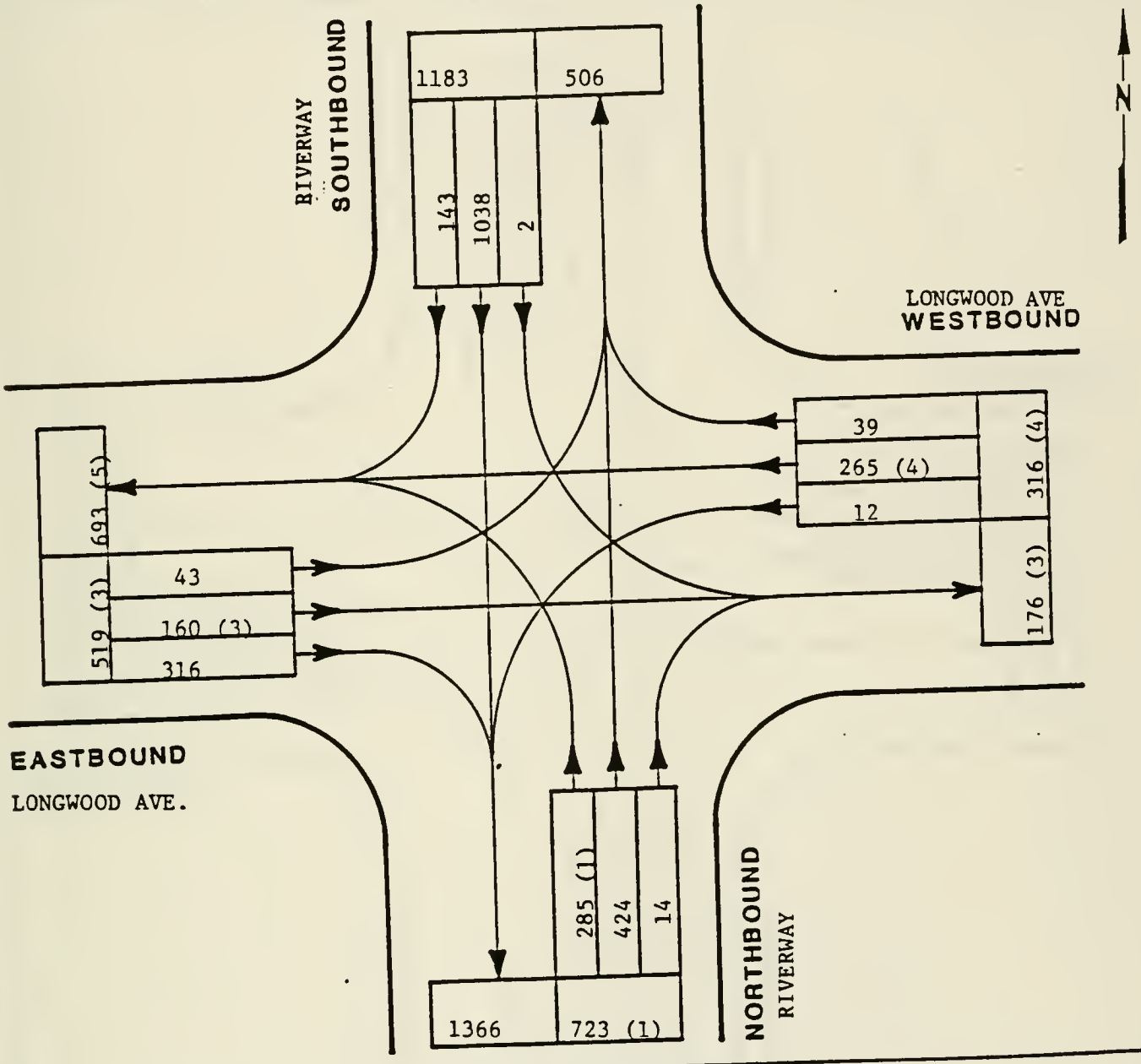
INTERSECTION TURNING MOVEMENT COUNT

CITY Boston, Ma DATE 8/6/85 DAY of WEEK Tuesday

INTERSECTION Longwood Ave./Riverway JOB No. 1098



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Riverway (NB)	723 (1)	26%	
Riverway (SB)	1183	43%	5:00 - 6:00
Longwood Ave (EB)	519 (3)	20%	
Longwood Ave (WB)	316 (4)	11%	P.M. PEAK HOUR
			VEHICLES COUNTED
			ALL VEHICLES XXX 2741
			TRUCKS (XX) 8
			PERCENT TRUCKS 0.3 %
TOTAL	2741 (8)	100.00%	

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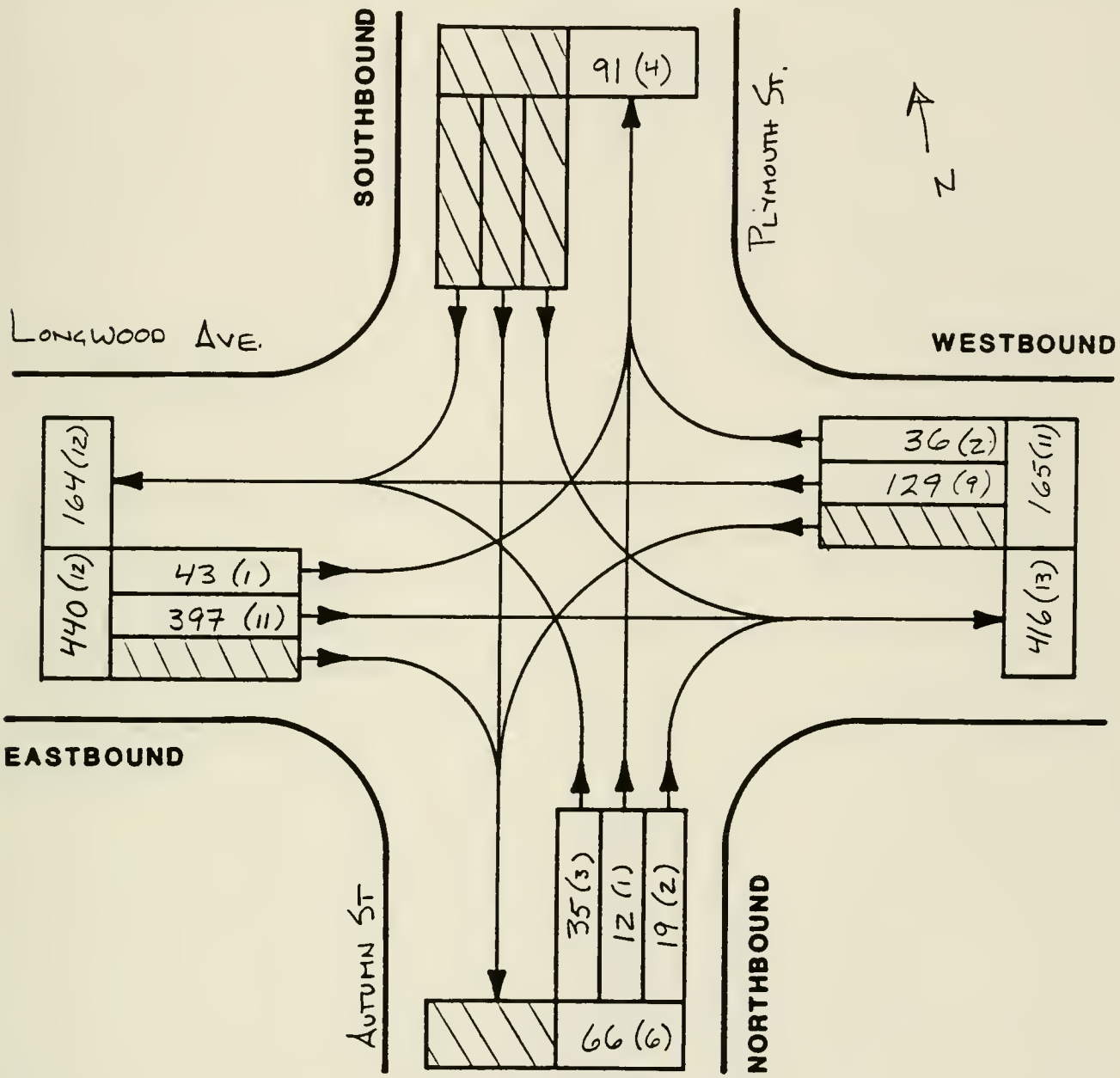
INTERSECTION TURNING MOVEMENT COUNT

CITY Boston, MA DATE 12/2/86 DAY of WEEK Tuesday
INTERSECTION Longwood Ave / Plymouth St / Autumn St. JOB No. 1722



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Longwood Ave EB	440 (12)	65.6 %	7:30 - 8:30
Longwood Ave WB	165 (11)	24.6 %	
Autumn St NB	66 (6)	9.8 %	AM Peak Hour
			VEHICLES COUNTED
			ALL VEHICLES XXX 671
			TRUCKS (XX) 29
TOTAL	671 (29)	100.0 %	PERCENT TRUCKS 4.3 %

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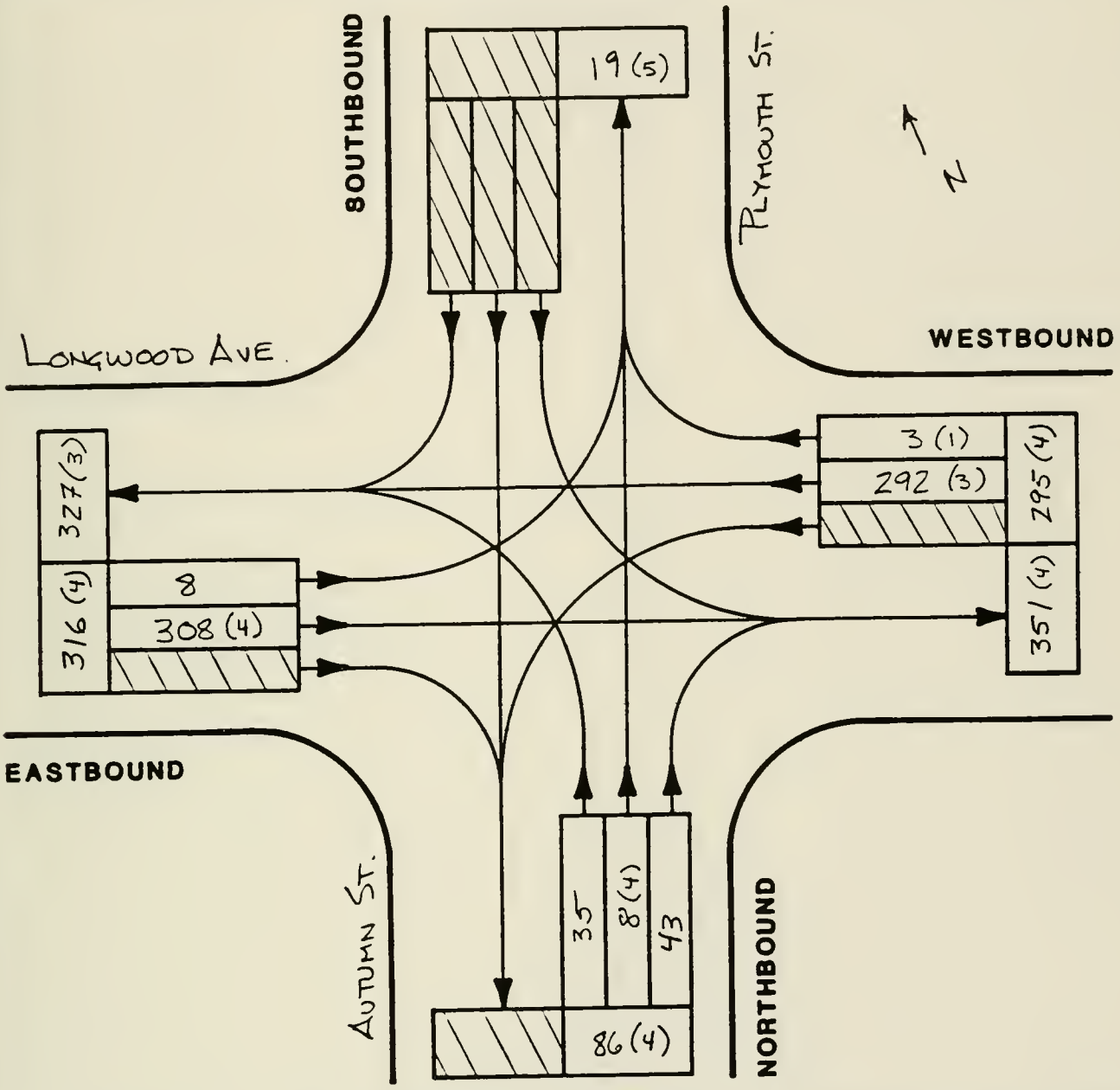
INTERSECTION TURNING MOVEMENT COUNT

CITY Boston MA DATE 12/3/86 DAY of WEEK Wednesday
INTERSECTION Longwood Ave / Plymouth St / Autumn St JOB No. 1722



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Longwood Ave EB	316 (4)	45.4 %	5:00 - 6:00
Longwood Ave WB	295 (4)	42.3 %	
Autumn St NB	86 (4)	12.3 %	PM Peak Hour
			VEHICLES COUNTED
			ALL VEHICLES XXX 697
			TRUCKS (XX) 12
TOTAL	697 (12)	100%	PERCENT TRUCKS 1.7 %

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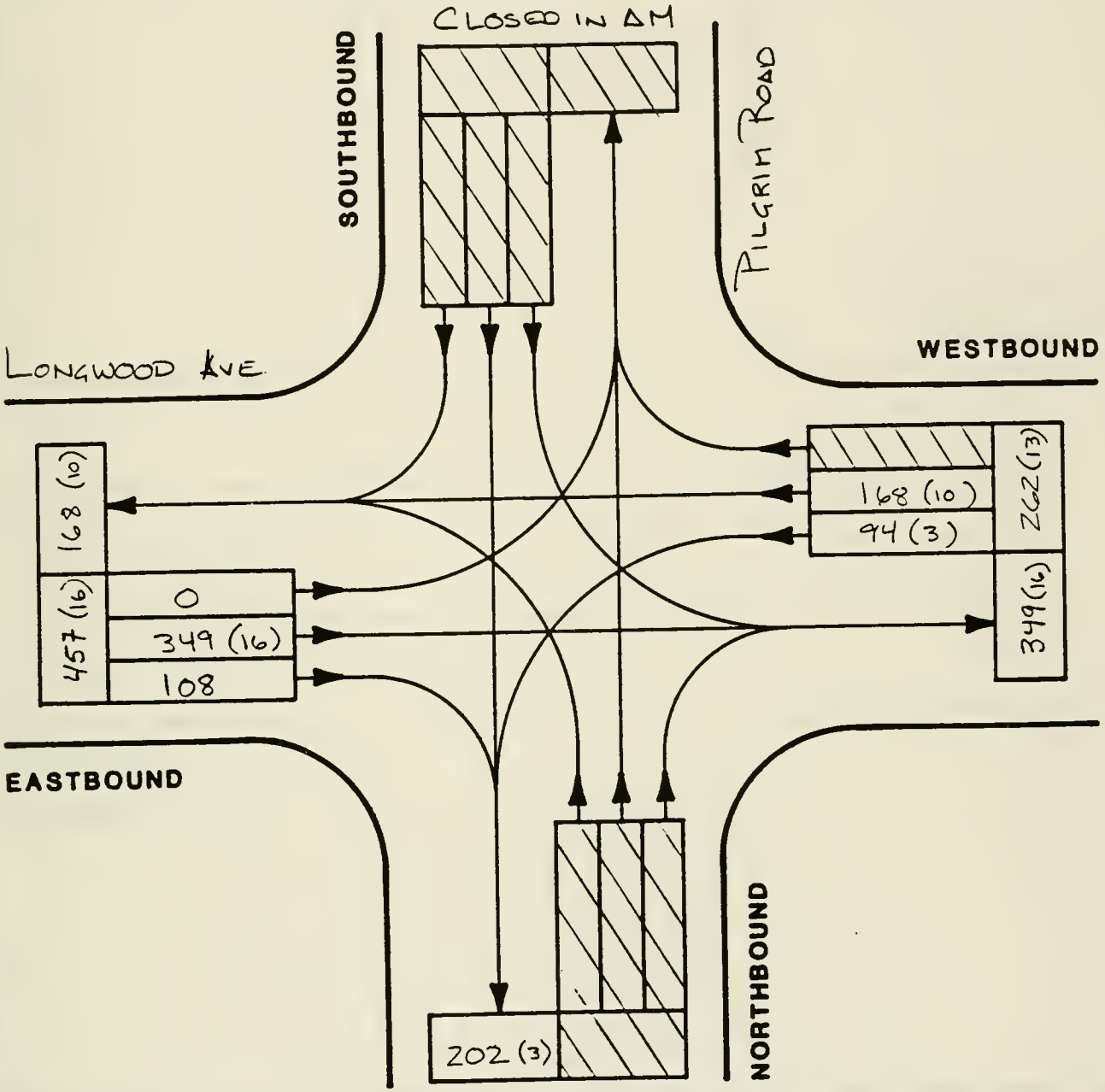
INTERSECTION TURNING MOVEMENT COUNT

CITY Boston, MA DATE 12/3/86 DAY of WEEK Wednesday
INTERSECTION Longwood Ave / Pilgrim Road JOB No. 1722



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Longwood Ave EB	457 (16)	63.6 %	7:45 - 8:45
Longwood Ave WB	262 (13)	36.4 %	
			AM Peak Hour
			VEHICLES COUNTED
			ALL VEHICLES XXX 719
			TRUCKS (XX) 29
TOTAL	719 (29)	100.0 %	PERCENT TRUCKS 4.0 %

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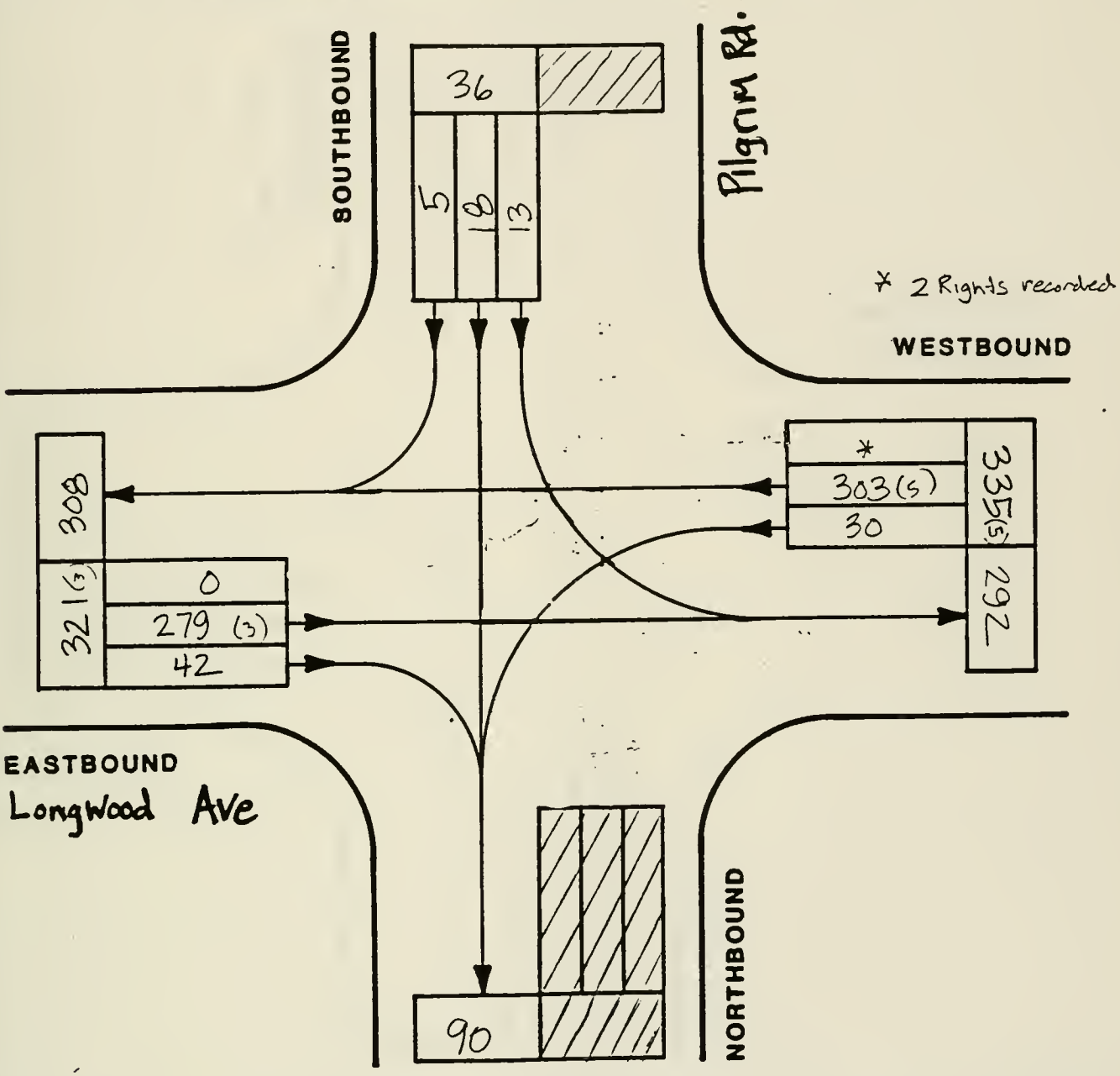
INTERSECTION TURNING MOVEMENT COUNT

CITY Boston Ma. DATE 12/3/86 DAY of WEEK Wed
INTERSECTION Longwood Ave at Pilgrim Road JOB No. 1722



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Longwood Ave EB.	321	46.4	4:30 – 5:30
Longwood Ave WB.	335	48.4	
PILGRIM Rd SB	36	5.2	PM PEAK Hour
			VEHICLES COUNTED
			ALL VEHICLES XXX 692
			TRUCKS (XX) 8
TOTAL			PERCENT TRUCKS 1.2 %

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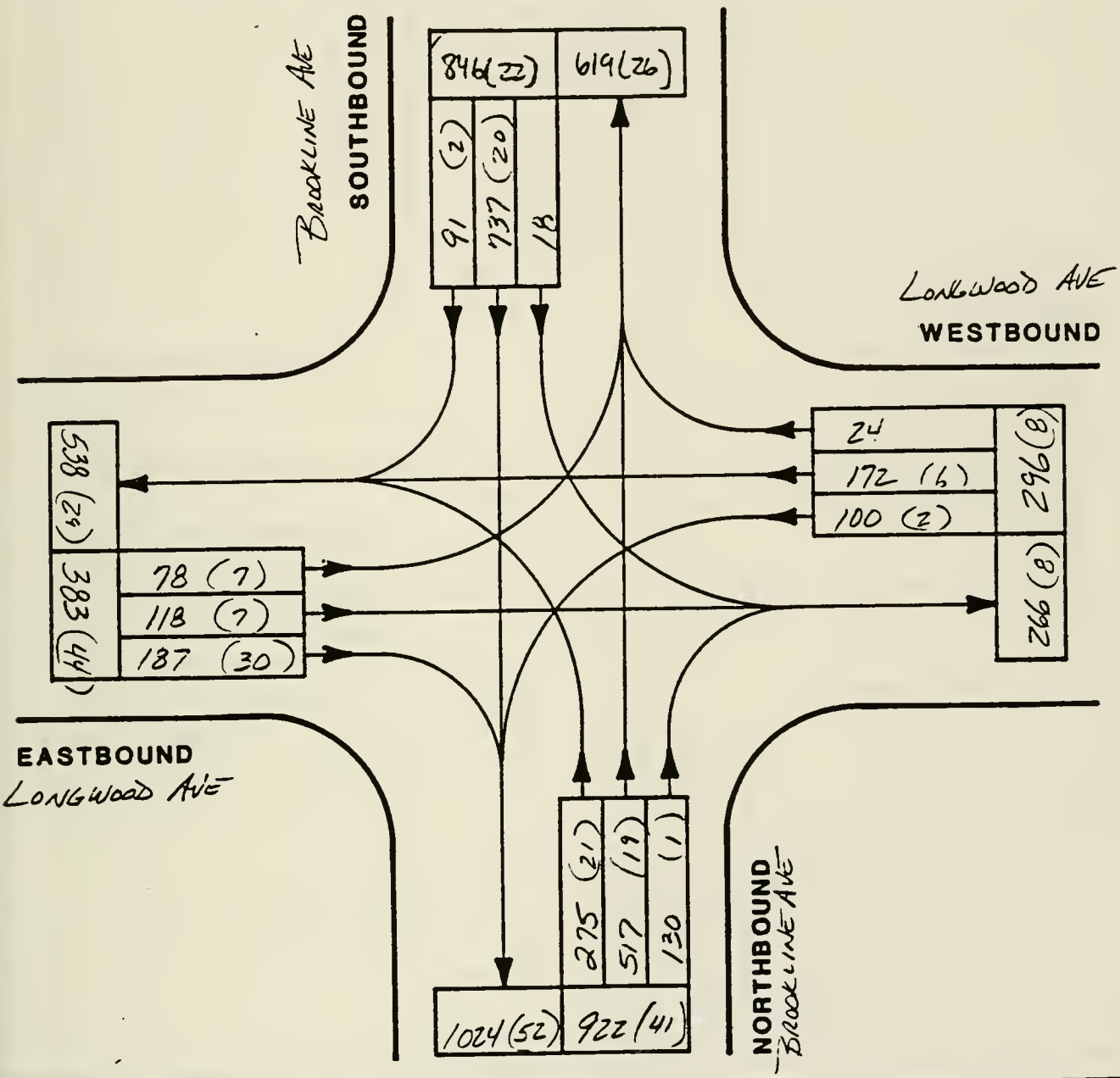
INTERSECTION TURNING MOVEMENT COUNT

CITY Boston MA DATE 10/9/84 DAY of WEEK THURSDAY
INTERSECTION Longwood Ave / Brookline JOB No. 1599



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Brookline Ave NB	922 (41)	37.7	AM Peak Hr
Longwood Ave WB	296 (8)	12.1	
Brookline Ave SB	846 (22)	34.6	7:30 - 8:30
Longwood Ave EB	383 (44)	15.7	
			VEHICLES COUNTED
			ALL VEHICLES XXX ≈2447
			TRUCKS (XX) 115
TOTAL	2447 (115)	100	PERCENT TRUCKS 4.7 %

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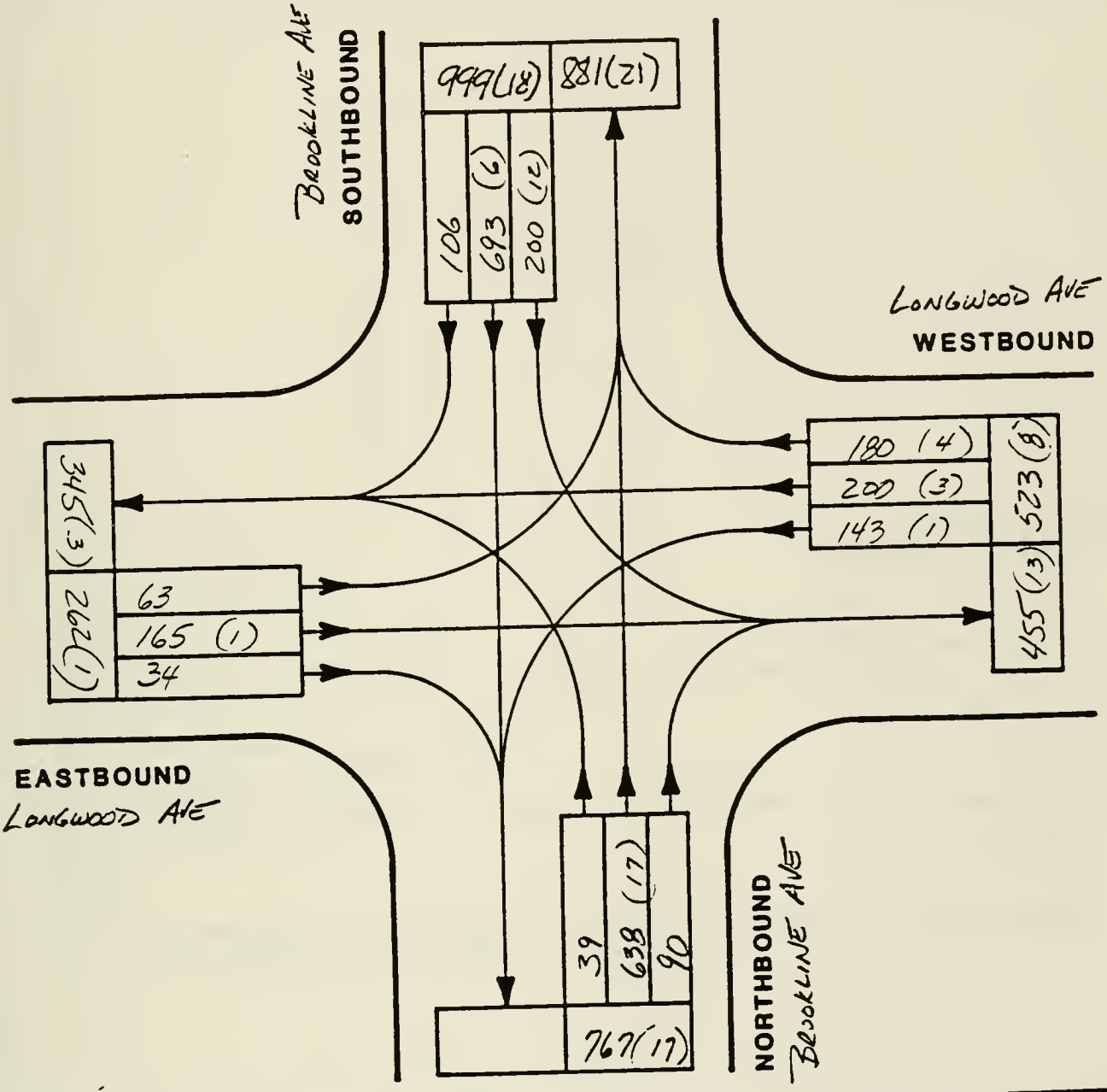
INTERSECTION TURNING MOVEMENT COUNT

CITY Boston MA DATE 10/9/86 DAY of WEEK THURSDAY

INTERSECTION BROOKLINE / LONGWOOD JOB No. 1599



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
BROOKLINE AVE NB	767 (17)	30.1	P.M. PEAK HR
LONGWOOD AVE WB	523 (8)	20.5	
BROOKLINE AVE SB	999 (18)	39.2	5:00 - 6:00
LONGWOOD AVE EB	262 (1)	10.3	
			VEHICLES COUNTED
			ALL VEHICLES XXX 2551
			TRUCKS (XX) 44
TOTAL	2551 (44)	100.1	PERCENT TRUCKS 1.7 %

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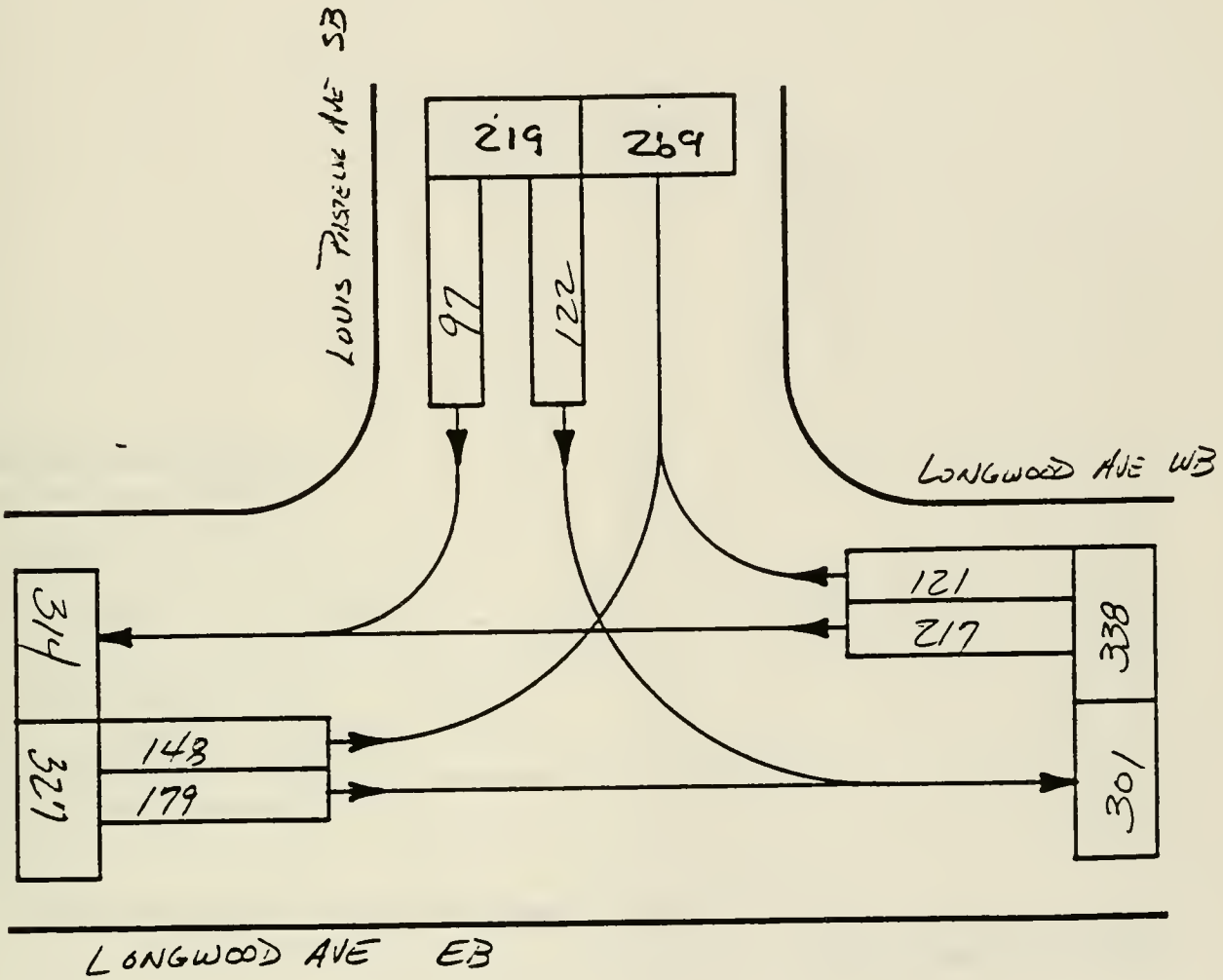
INTERSECTION TURNING MOVEMENT COUNT

CITY Boston MA DATE 10/15/86 DAY of WEEK Wednesday
INTERSECTION Longwood Ave / Louis Pasteur Ave JOB No. 1599



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Longwood Ave EB	327	37	AM Peak Hr
Louis Pasteur Ave S	219	24.8	
Longwood Ave WB	338	38.2	7:30 - 8:30
			VEHICLES COUNTED
			ALL VEHICLES XXX 884
			TRUCKS (XX) 10
TOTAL	884	100	PERCENT TRUCKS 10 %

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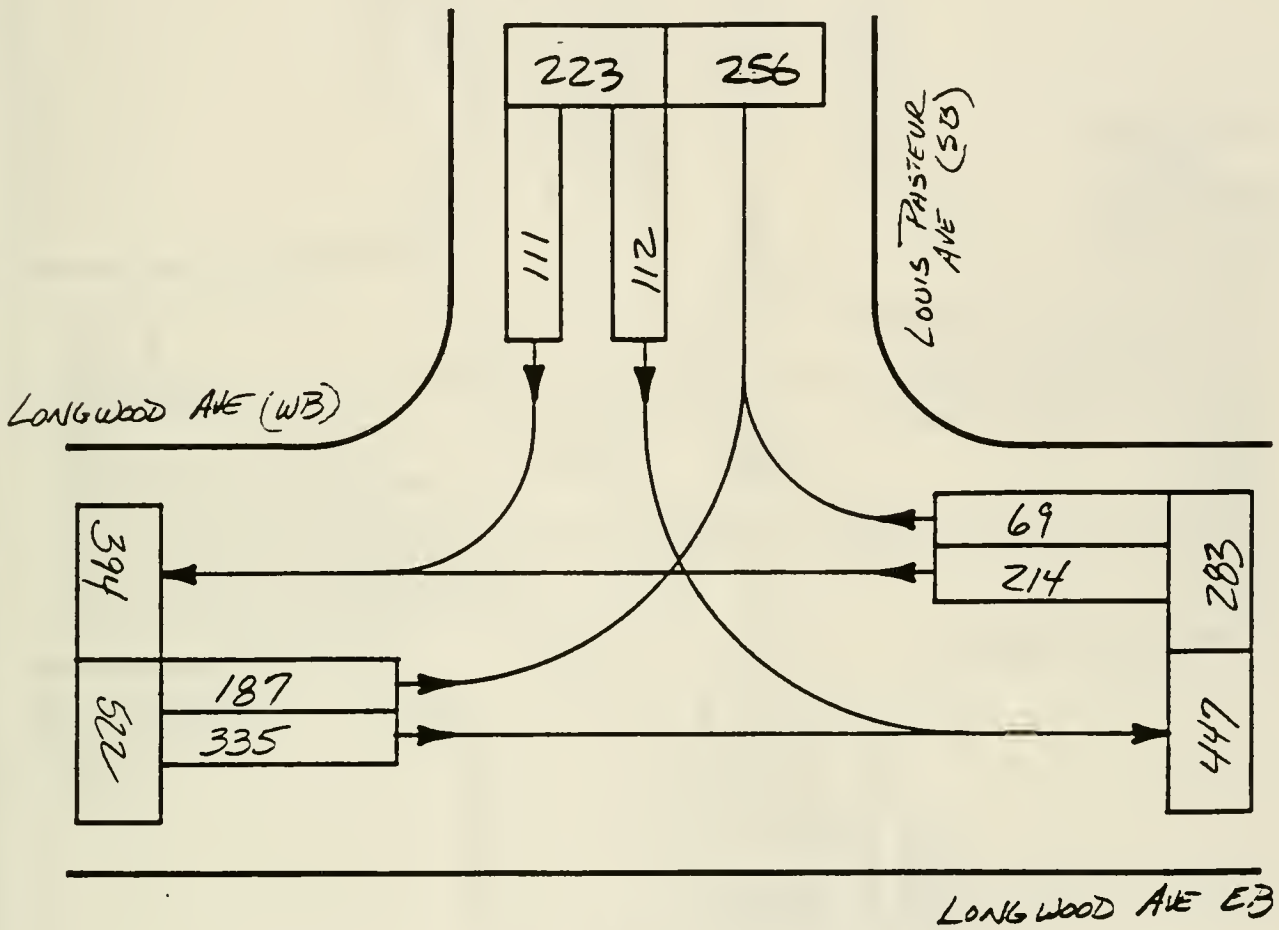
INTERSECTION TURNING MOVEMENT COUNT

CITY Boston MA DATE 10/15/86 DAY of WEEK Wednesday

INTERSECTION Longwood Ave / Louis Pasteur Ave JOB No. 1599



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Longwood Ave EB	522	50.7	PM. Peak Hr.
Louis Past Ave SB	223	21.7	
Longwood Ave WB	283	27.6	5:00 - 6:00
			VEHICLES COUNTED
			ALL VEHICLES XXX 1029
			TRUCKS (XX) 6
TOTAL	1029		PERCENT TRUCKS 0 %

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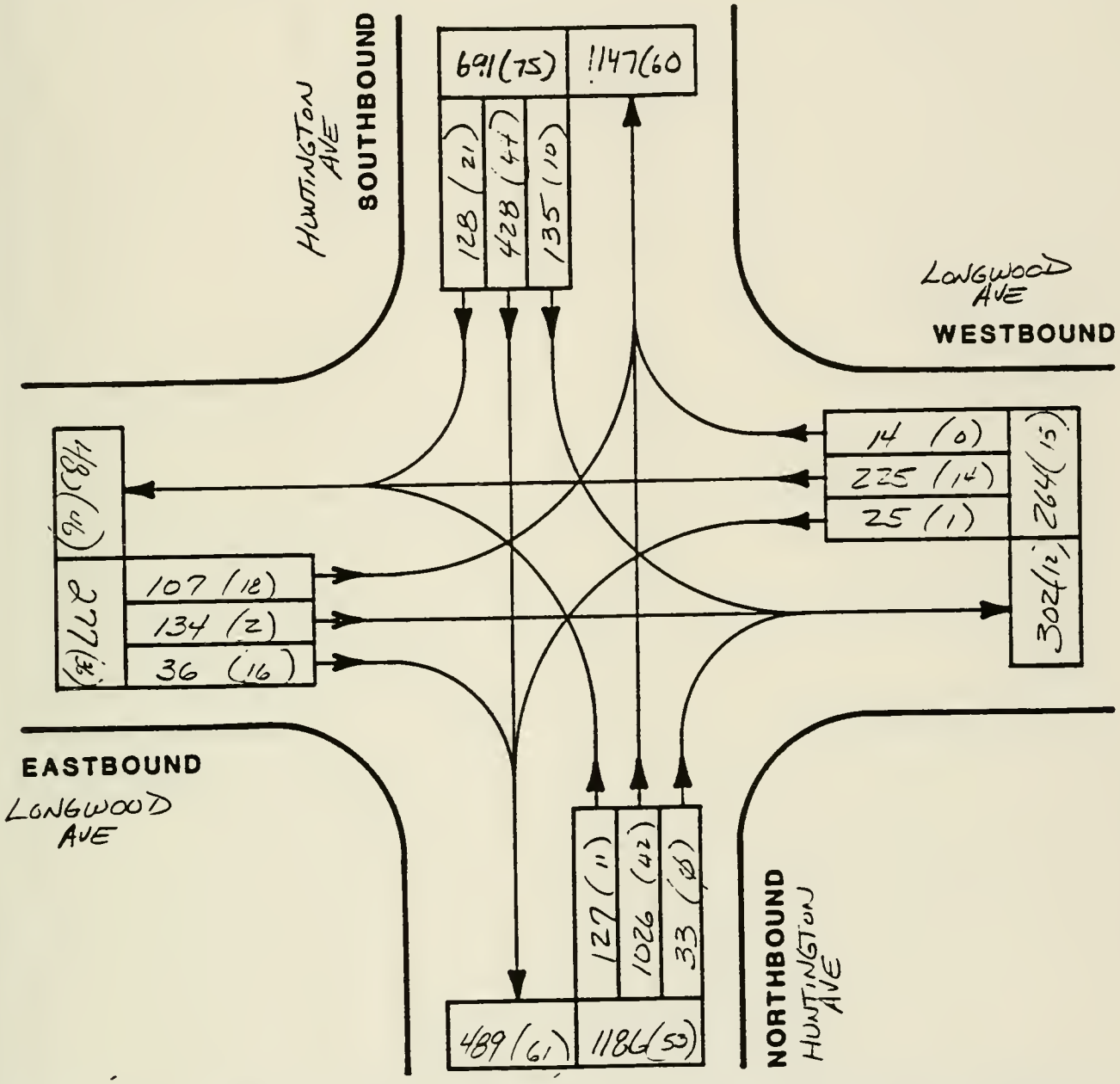
INTERSECTION TURNING MOVEMENT COUNT

CITY Boston MA DATE 10/15/86 DAY of WEEK WEDNESDAY

INTERSECTION LONGWOOD AVE / HUNTINGTON AVE JOB No. 1599



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
HUNTINGTON AVE NB	1186 (53)	49	AM PEAK HR.
LONGWOOD AVE WB	264 (15)	10 9	
LONGWOOD AVE EB	277 (36)	11 5	7:30 - 8:30
HUNTINGTON AVE SB	691 (75)	28 6	
			VEHICLES COUNTED
			ALL VEHICLES XXX 2413
			TRUCKS (XX) 179
TOTAL	[illegible]	100 %	PERCENT TRUCKS 7.5 %

PEAK HR. FACTOR .91

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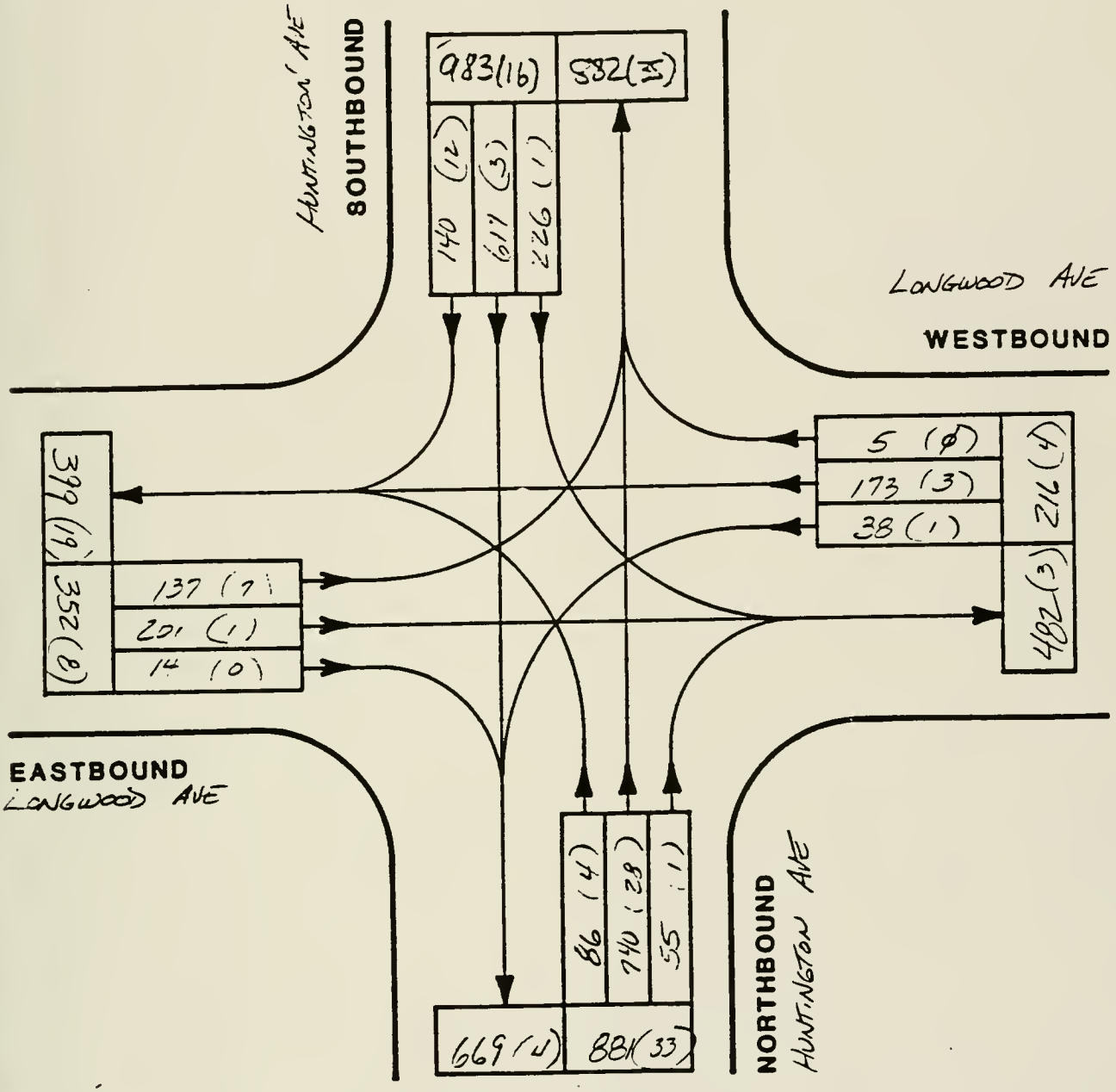
INTERSECTION TURNING MOVEMENT COUNT

CITY Boston MA DATE 10/15/96 DAY of WEEK WEDNESDAY

INTERSECTION HUNTINGTON / LONGWOOD JOB No. 1599



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
HUNTINGTON AVE NE	881 (33)	36.2	PM PEAK HR.
LONGWOOD AVE WB	216 (4)	8.9	
LONGWOOD AVE EB	352 (8)	14.5	5:00 - 6:00
HUNTINGTON AVE SE	983 (16)	40.4	
			VEHICLES COUNTED
			ALL VEHICLES XXX 2432
			TRUCKS (XX) 61
TOTAL	2432 (61)	100%	PERCENT TRUCKS 2.5 %

3959 1145

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